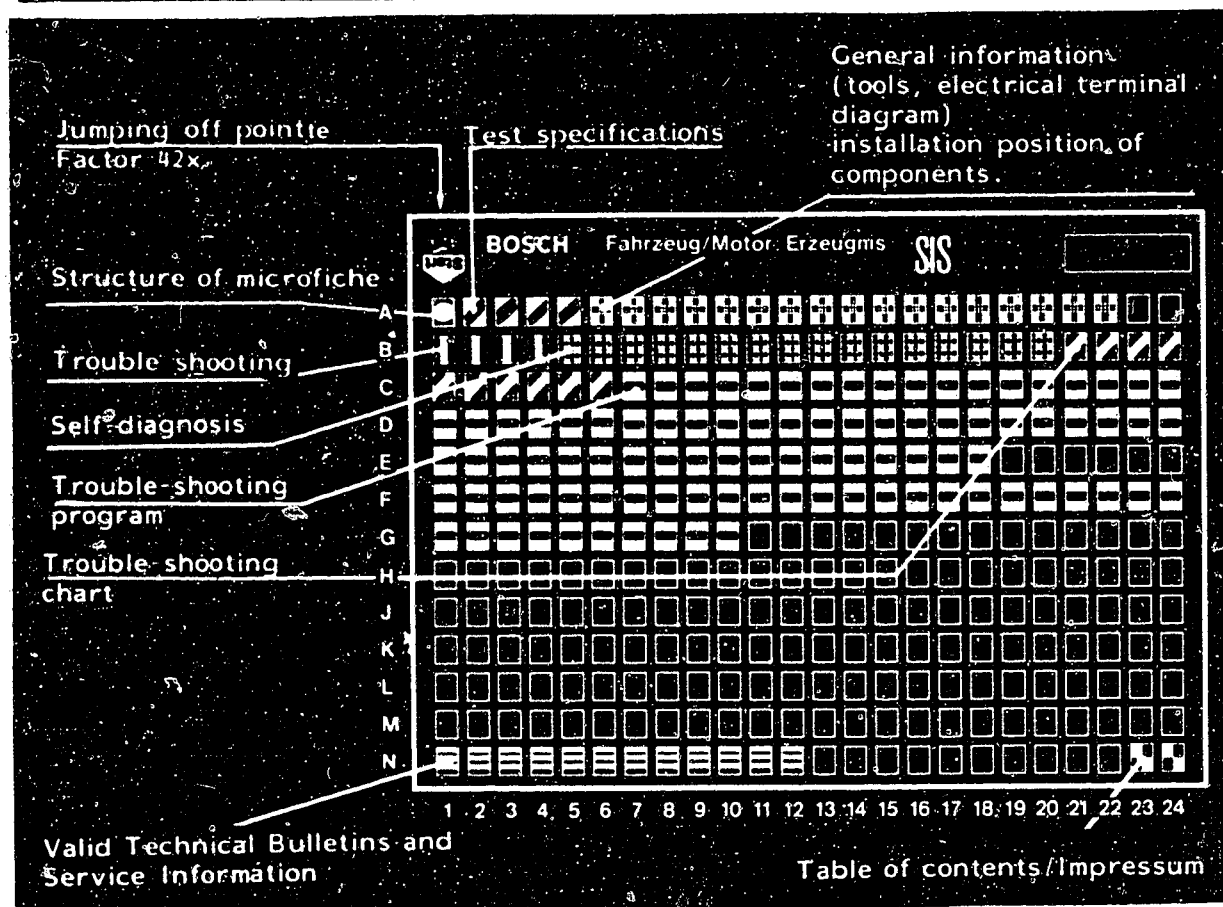


## Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

<b>E16</b>	Product/component/test step
	Vehicle/engine

Coordinate

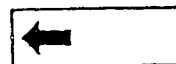
3. Limits of section



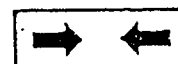
Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

**C6**

**A1**

Trouble-shooting program



## 1. Test specifications

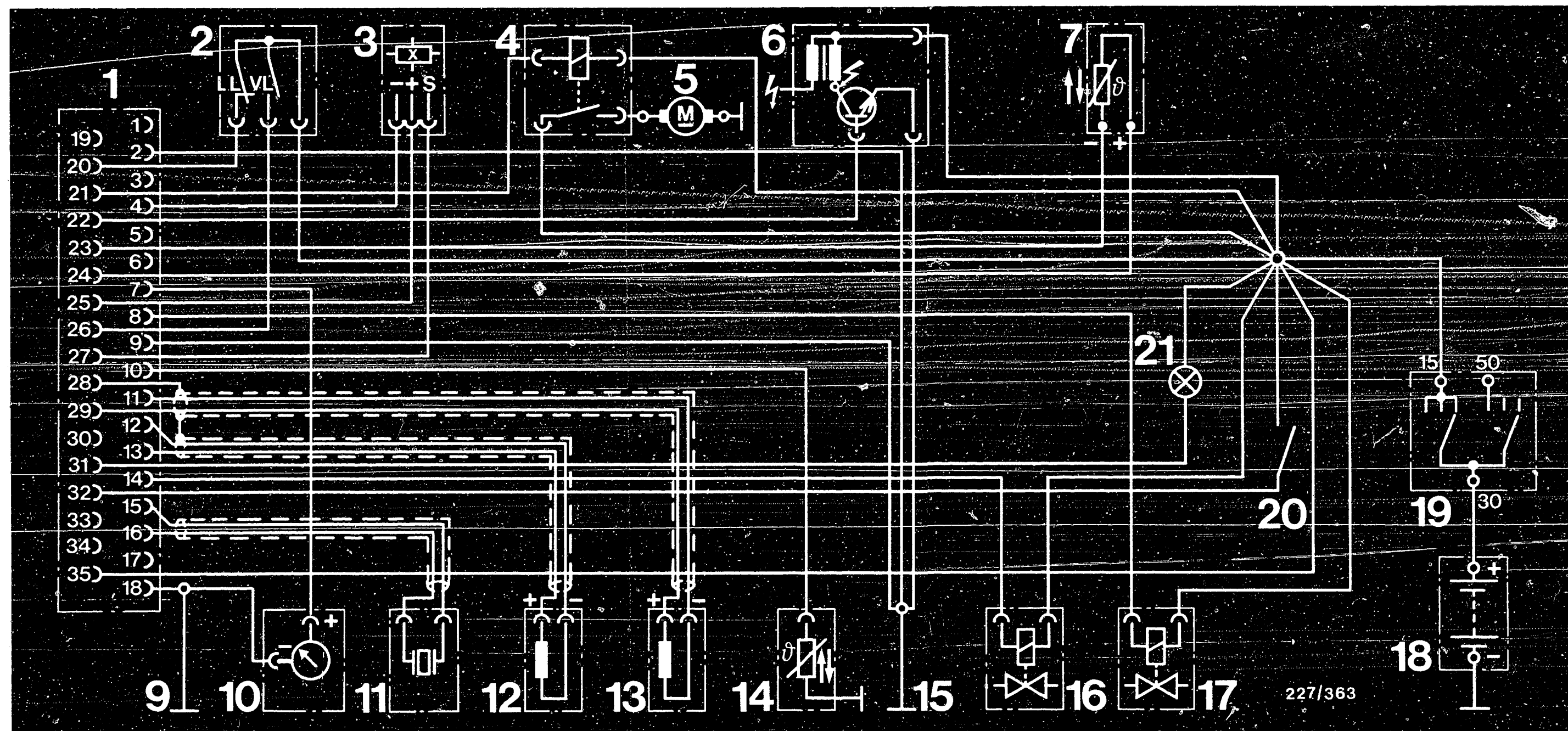
Ignition coil primary (versions 1 and 2)	approx. 1.2 $\Omega$	<b>C9</b>
Ignition coil secondary Version 1 Version 2	approx. 6.8 k $\Omega$ approx. 7.7 k $\Omega$	<b>C9</b>
Coolant-temperature sensor +15 ... +30°C +80°C	600 ... 1500 $\Omega$ 100 ... 140 $\Omega$	<b>D13</b>
Intake-air temperature	400 ... 700 $\Omega$	<b>D15</b>
Spark advance angle Bosch/Hitachi control unit (Europe version excluding Sweden, Switzerland) at idle speed and with idle switch closed	12° ... 18° BTDC  800 ... 850 min <sup>-1</sup>	<b>E1</b>
Spark advance angle Hitachi control unit (Sweden, Switzerland version) at engine speed Coolant-temperature sensor and with idle switch closed	4° ... 8° BTDC  800 ... 1500 min <sup>-1</sup> approx. 80°	



Control unit power supply	12 ... 14 V	<b>E15</b>
Ignition coil power supply	$\geq 10$ V	<b>E17</b>
Internal resistance of engine-speed sensor	approx. 1 k $\Omega$	<b>F7</b>
		<b>F11</b>
Engine-speed sensor voltage	$U_{\text{peak-peak}} > 2.5$ V	
		<b>F15</b>
Internal resistance of reference-mark sensor	approx. 1 k $\Omega$	
Reference-mark sensor voltage	$U_S > 2$ V	<b>F19</b>

See Autodata test specifications for settings, for idle speed, exhaust gas, valve clearance etc.





⚡ = Dangerous voltages (400 V - 25 kV)

## 2. Electrical terminal diagram

- 1 = Wiring-harness plug (control unit)
- 2 = Idle and full-load switch
- 3 = Ignition pulse generator
- 4 = Electric fuel pump relay
- 5 = Electric fuel pump
- 6 = Ignition coil with power output stage
- 7 = Intake-air temperature sensor

- 9 = Electronics ground
- 10 = Tachometer
- 11 = Knock sensor
- 12 = Reference-mark sensor
- 13 = Engine-speed sensor
- 14 = Coolant-temperature sensor
- 15 = Vehicle ground

- 16 = Overrun-cutoff valve
- 17 = Enrichment valve
- 18 = Battery
- 19 = Ignition and starting switch
- 20 = Stop-lamp switch
- 21 = Fault lamp

**A4**

Electrical terminal diagram  
Audi 200, as of 8.83

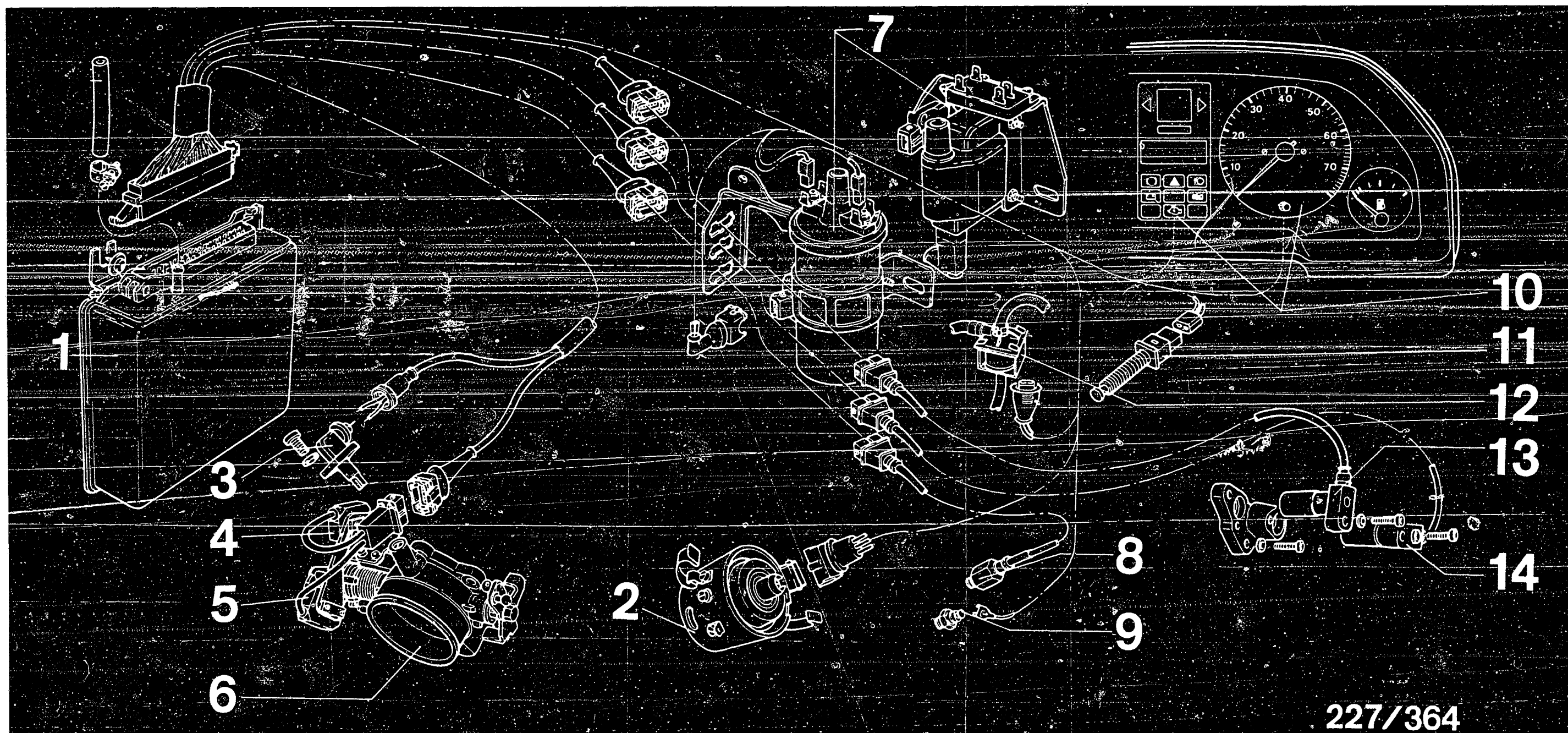


**A5**

Electrical terminal diagram  
Audi 200, as of 8.83







227/364

## 2. Installation position of components

- 1 = Control unit
- 2 = Ignition distributor
- 3 = Intake-air temperature sensor
- 4 = Full-load switch
- 5 = Idle switch
- 6 = Throttle-valve part

- 7 = Ignition coils
- 8 = Knock sensor
- 9 = Coolant-temperature sensor
- 10 = Instrument panel with fault lamp and tachometer

- 11 = Stop-lamp switch
- 12 = Two-way valve
- 13 = Reference-mark sensor
- 14 = Engine-speed sensor

**A6**

Installation position of components  
Audi 200, as of 8.83



**A7**

Installation position of components  
Audi 200, as of 8.83



The following description describes only those components whose installation position is not readily apparent and which require notes on how to remove or install.

Control unit, is situated in the front passenger footwell on the right-hand side. See arrow in top picture.

How to remove: Remove cover for control unit (not shown).

Intake-air temperature sensor, is situated on the intake manifold behind the throttle valve (not shown).

How to install: If installing a new intake-air temperature sensor, remove protective cap before installing. Attach cable lugs to connecting leads. Solder cable lugs onto contacts of intake-air temperature sensor. Connecting leads/cable lugs must be insulated (insulating rubber).

Knock sensor, is situated under the warm-up regulator. See arrow in center picture.

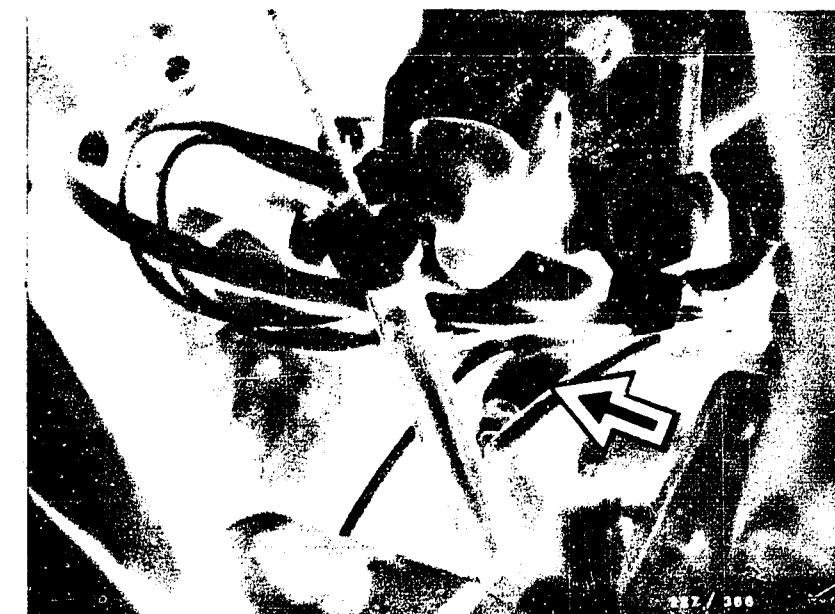
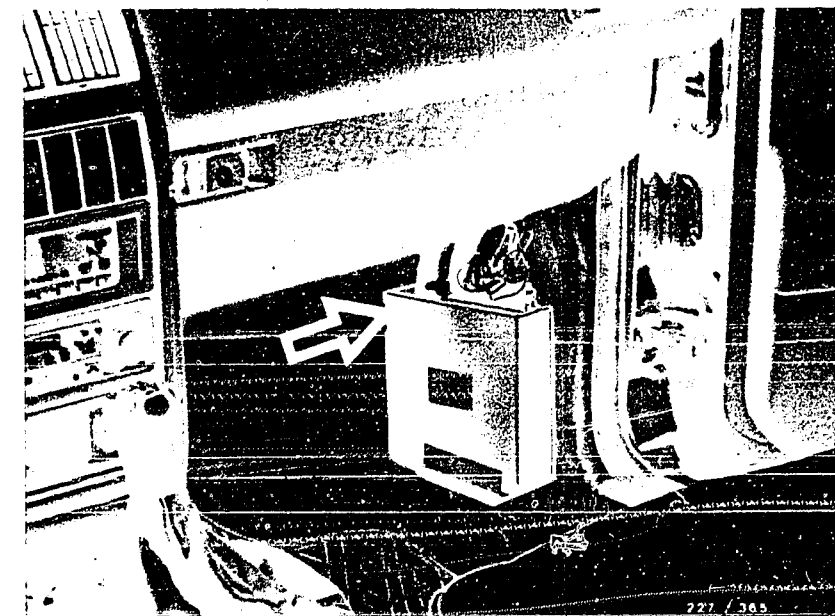
Coolant-temperature sensor, is situated under the spark-plug connector of cylinder 1 (not shown).

Stop-lamp switch, is situated in the driver's footwell (brake pedal, foot lever mechanism). Not shown.

Engine-speed and reference-mark sensors, are situated in a common bracket which is mounted onto the side of the engine block (on left-hand side in forward direction of travel). See bottom picture

1 = Reference-mark sensor

2 = Engine-speed sensor.



**A8**

Installation position of components  
Audi 200, as of 8.83



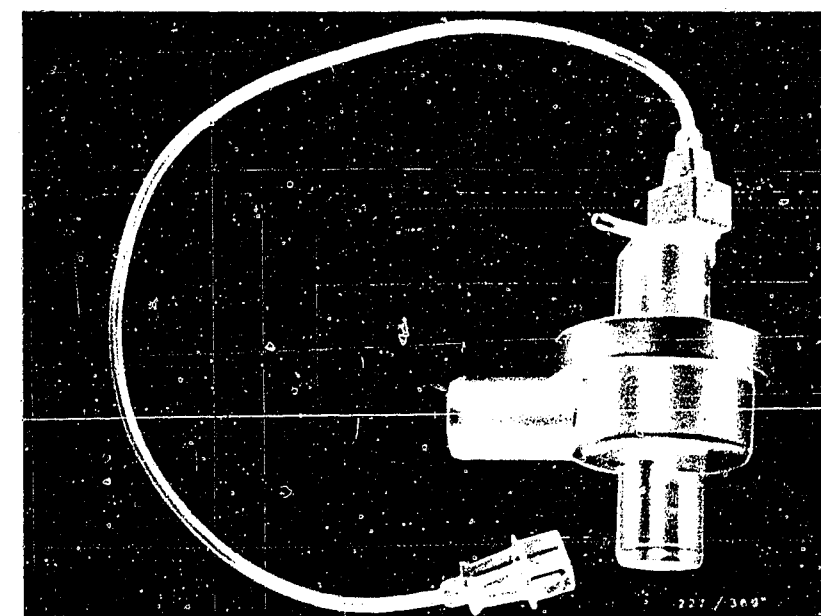
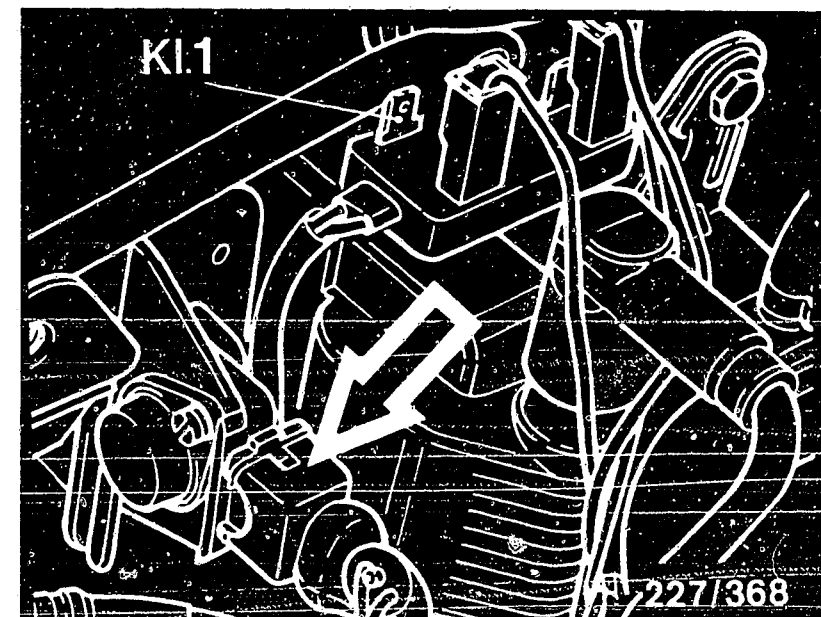
**A9**

Installation position of components  
Audi 200, as of 8.83



Power output stage, is situated on side of ignition coil. See arrow in top picture.

Overrun-cutoff valve, is situated in air-filter housing (next to mixture-control unit).  
See bottom picture.



**A10**

Installation position of components

Audi 200, as of 8.83

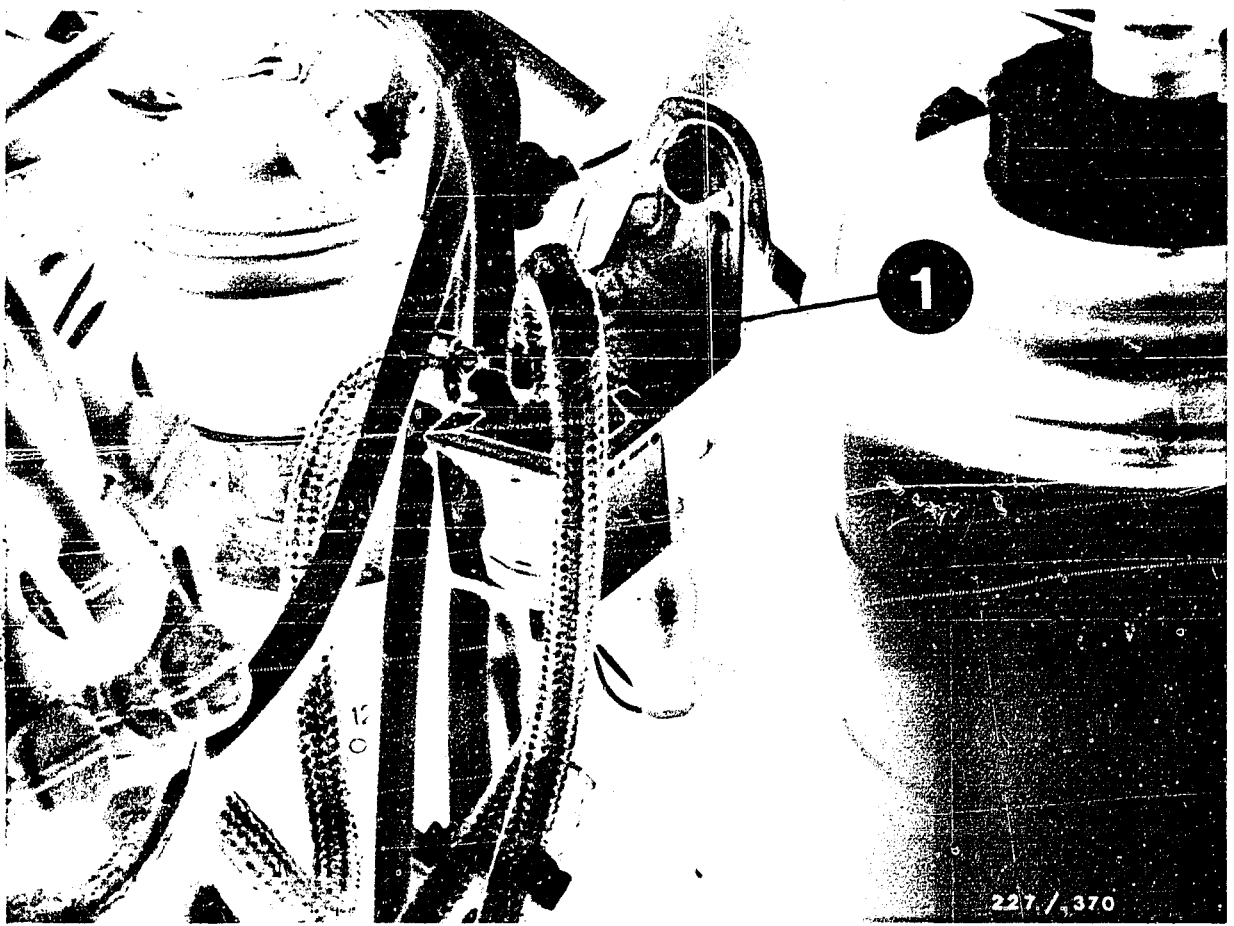


**A11**

Installation position of components

Audi 200, as of 8.83



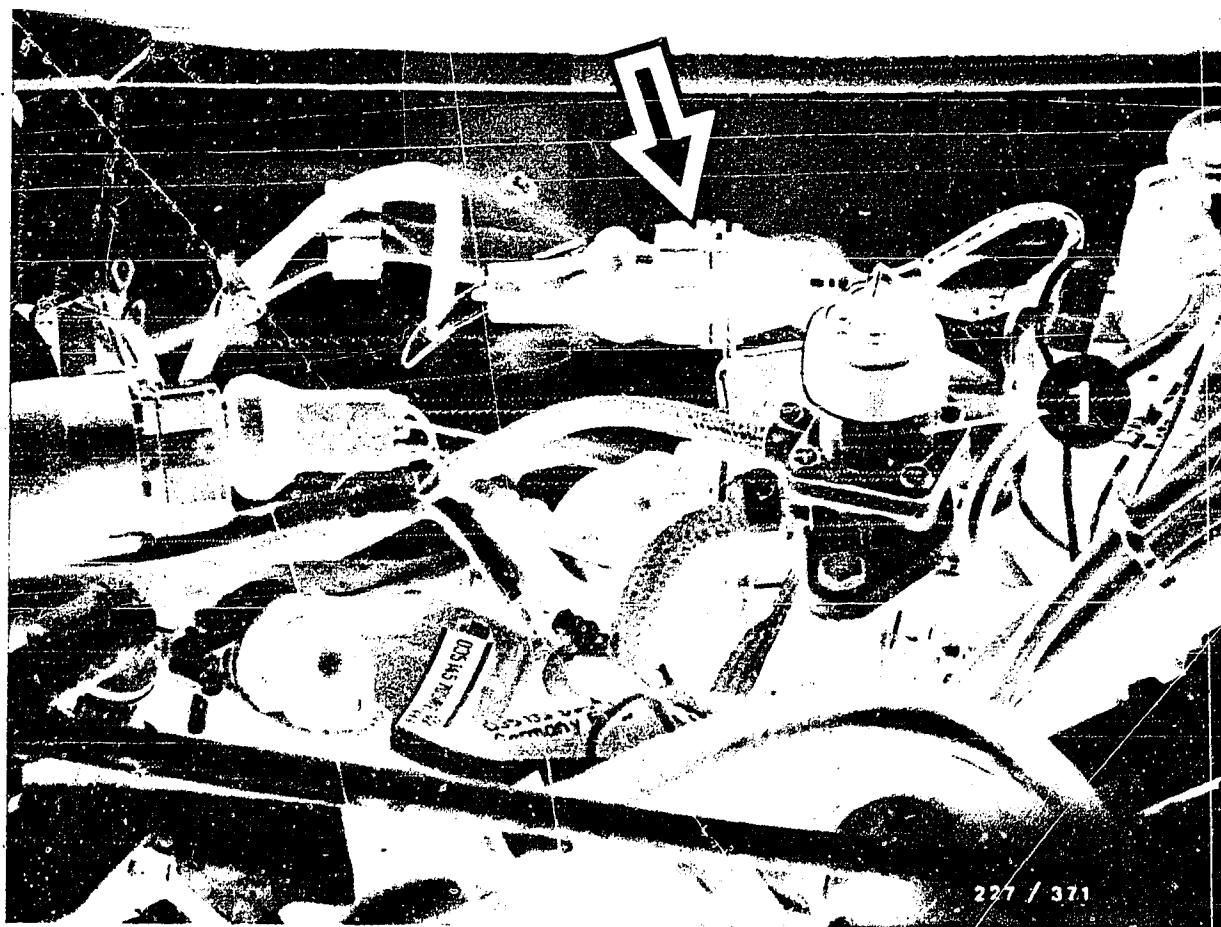


1 = Two-way valve (enrichment)

**A12**

Installation position of components  
Audi 200, as of 8.83





1 = Vacuum-control valve for exhaust-gas recirculation

Arrow = Plug-in connection

**A13**

Installation position of components  
Audi 200, as of 8.83



#### 4. Necessary test equipment, aids

Motortester e. g.	MOT 201	0 684 000 201
Spark gap e. g. ignition coil and condenser tester or single spark gap	EFAW 106 A EF 1177/7	0 681 100 001 1 684 531 000
5 k $\Omega$ sleeve-type suppressor		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or e. g.	Pontavi Wh2	commercially available
Voltmeter e. g.	ETE 014.00	0 684 101 400
Test prods		commercially available
Vacuum pump, e.g. Mityvac from Fa. Korinth Ludwig-Kloos-Str. 21 6450 Hanau 7-Steinheim		Commercially available
Angle measuring device	KDJE 7462	



## 5. Danger of accident on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts of terminals are touched (both on the primary as well as the secondary sides).

In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, ignition cable etc.).

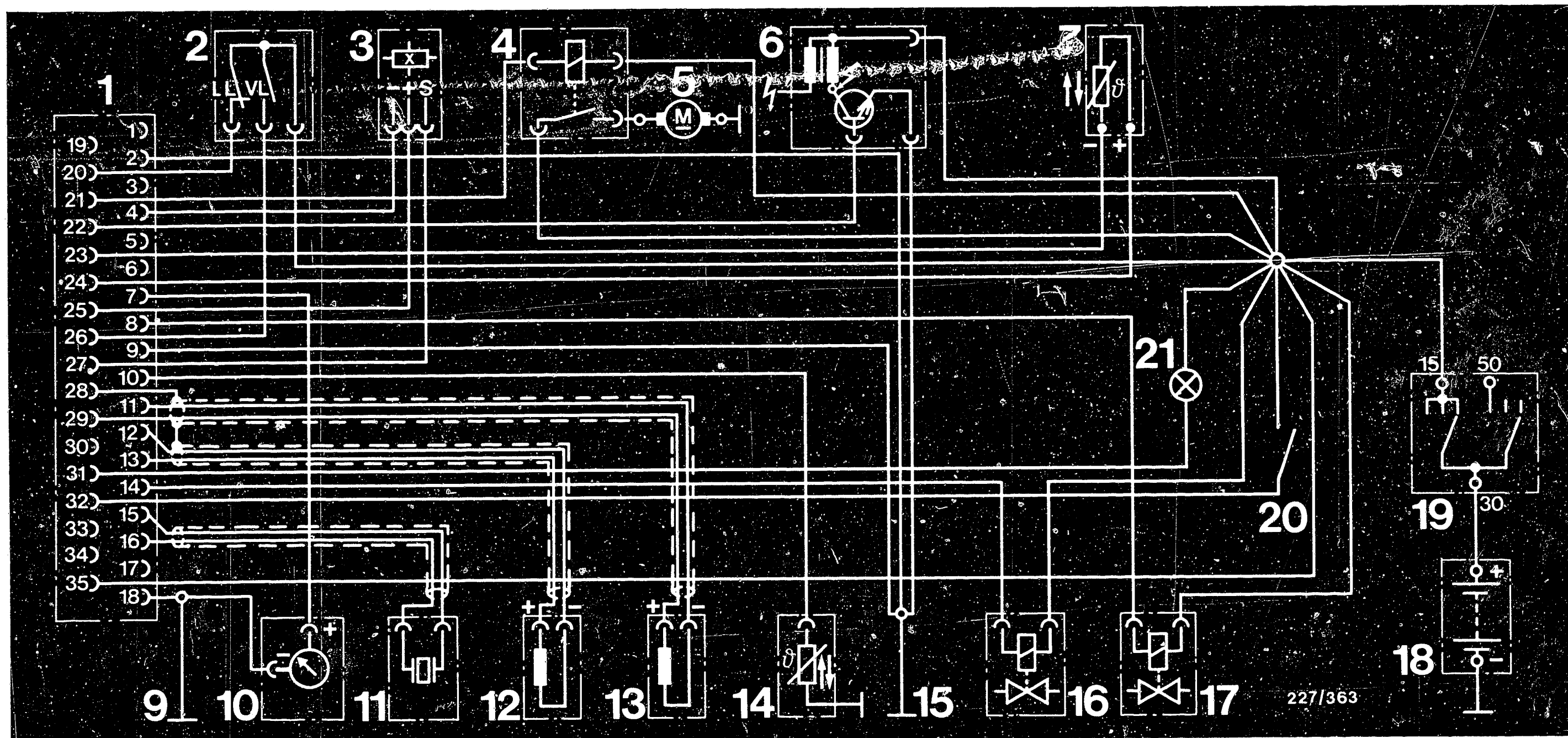


If, when testing the ignition system or performing adjustment work on the engine (e.g. K-Jetronic), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual components of the ignition system (e.g. ignition distributor, ignition coil, ignition harness), but also on the wiring harness (e.g. tachometer connection, diagnostic plug) at plug-in connections and on testers.







⚡ = Dangerous voltages (400 V - 25 kV)

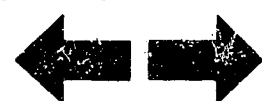
# Electrical terminal diagram

- |                               |   |                                 |                               |
|-------------------------------|---|---------------------------------|-------------------------------|
| 1 = Wiring-harness plug       | 6 = Ignition coil with power output stage | 12 = Reference-mark sensor      | 16 = Overrun-cutoff valve     |
| 2 = Idle and full-load switch | 7 = Intake-air temperature sensor         | 13 = Engine-speed sensor        | 17 = Enrichment valve         |
| 3 = Ignition pulse generator  | 9 = Electronics ground                    | 14 = Coolant-temperature sensor | 18 = Battery                  |
| 4 = Electric fuel pump relay  | 10 = Tachometer                           | 15 = Vehicle ground             | 19 = Ignition/starting switch |
| 5 = Electric fuel pump        | 11 = Knock sensor                         |                                 | 20 = Stop-lamp switch         |
|                               |   |                                 | 21 = Fault lamp               |

The dangerous locations are identified with danger arrows taking the example of the terminal diagram of an electronic ignition system.

**A17**

Danger of accidents  
Audi 200, as of 8.83



**A18**

Danger of accidents  
Audi 200, as of 8.83



6. Incorrect indication of engine speed, dwell angle and ignition timing

In ignition systems with control unit 0 227 400 007 (EZ-K) or Hitachi control unit with current limitation there may be an incorrect indication of engine speed, dwell angle and ignition timing on testers.

For further details, see Coordinates N 7 - N 11.



## 7. Important vehicle information

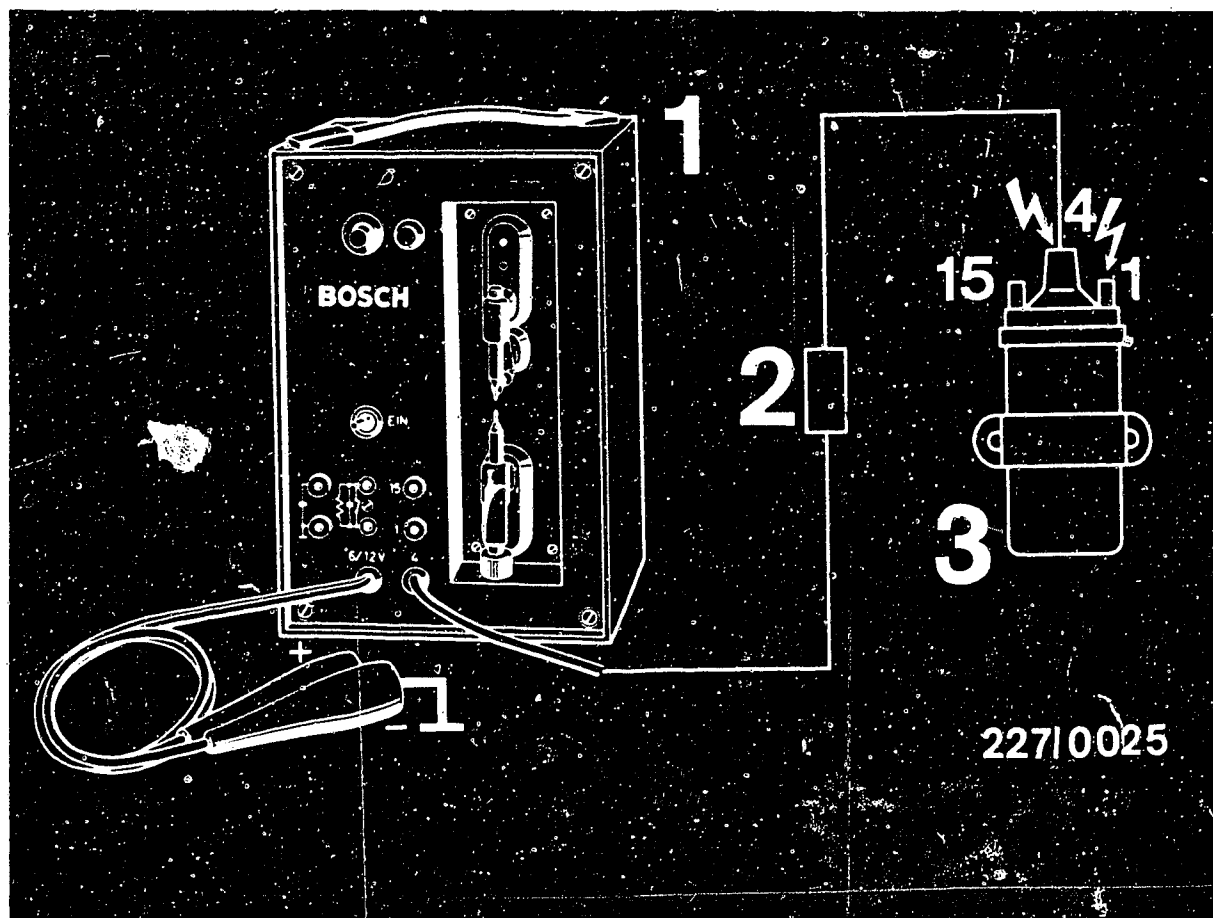
- Resistance measurements must only be performed with the ignition switched off or with the battery disconnected (measuring instrument defective).
- When testing compression, disconnect control-unit plug or firmly ground ignition coil term. 4 using auxiliary cable (dangerous high voltage, insulation damage to ignition coil, ignition distributor, ignition harness).

### Note:


The extra cable must be suppressed with at least  $2\text{ k } \Omega$ , e. g. with sleeve-type suppressor ( $5\text{ k } \Omega$ ) 0 356 500 001.

- The specified ignition coil must not be replaced with a different ignition coil.
- No suppression capacitor must be connected to ignition coil terminal 1 and terminal 15.
- Ignition coil terminal 1 must not be brought into contact with ground as a theft-proofing measure (ignition coil will be destroyed when ignition is switched on).
- No battery + or test lamp must be connected to ignition coil terminal 1 (trigger box will be destroyed).
- Ignition cable from ignition coil terminal 4 to ignition distributor terminal 4 must not be disconnected during operation.
- There must be no arcing from ignition coil terminal 4 to ignition coil terminal 1 and 15. The magnetic pick-up assembly and trigger box may be destroyed.





- 1 = Spark gap
- 2 = 5 k $\Omega$  sleeve-type suppressor
- 3 = Ignition coil

 = dangerous voltages (400 V - 25 kV)

- In order to prevent the trigger box from being irreparably damaged, when using a spark gap, an interference-suppression resistor of at least 4 k $\Omega$  must be connected between the spark gap and ignition coil terminal 4, e. g. sleeve-type suppressor (5 k $\Omega$  ) 0 356 500 001.

- In order to prevent the trigger box from being irreparably damaged, the secondary side of the ignition system must have at least 4 k  $\Omega$  interference suppression whereby the original distributor rotor with 1 k  $\Omega$  interference-suppression resistor must be fitted (even in the case of radio and spark interference suppression do not use a 5 k  $\Omega$  distributor rotor).
- No external voltage, e. g. ohmmeter, must be connected to the ignition distributor magnetic pickup assembly (Hall generator).  
Caution when switching over measuring ranges.
- The lines from the Hall generator to the trigger box must be laid separately from other lines. There must be at least 100 mm distance between Hall generator lines and the ignition cables and the line from terminal 1 of the trigger box to terminal 1 of the ignition coil (Hall generator will be destroyed).
- The holding springs of the distributor cap must not drop into the pickup system when the engine is being cranked and with the dust-protection cover removed.
- Arcing or breakdown of insulation at the distributor cap (poor insulation) may lead to the destruction of the magnetic pickup assembly and trigger box.
- Do not disconnect battery with engine running.
- Incorrect battery polarity will lead to the destruction of the magnetic pickup assembly of the ignition distributor, trigger box and ignition coil as well as ignition timing unit.
- Do not use a starting aid with more than 16 V or a fast charger for starting.



## 8. Trouble-shooting

### 8.1 How to use the self-diagnosis and self-diagnosis test chart

This vehicle is equipped with control units (Bosch/Hitachi) which have a self-diagnosis. Whenever testing, therefore, begin with the self-diagnosis.

Coordinate B5 describes how to activate the self-diagnosis.

The self-diagnosis test chart beginning on Coordinate B15 contains fault indication (consisting of the tachometer installed in the vehicle and the fault lamp), cause of fault, test instructions and the Coordinate reference for direct trouble-shooting.

If the self-diagnosis does not indicate a fault and the customer complaint is still not remedied, trouble-shooting must be continued with the trouble-shooting chart/trouble-shooting program starting on Coordinate B21.

### 8.2 How to use the trouble-shooting chart

The trouble-shooting chart starting on Coordinate B11 contains customer complaint (fault symptoms), cause of fault, test instructions and Coordinate reference. Select the possible cause of the fault from the trouble-shooting chart in accordance with the customer complaint (fault symptom).

If the cause of the fault is not clear, start testing with the detailed, self-contained trouble-shooting program on Coordinate C7.

If the cause of the fault has been clearly identified in accordance with the trouble-shooting chart, then by going to the stated Coordinate reference it is possible to conduct direct trouble-shooting without having to go through the entire trouble-shooting program for each fault.

If there is no Coordinate reference, conduct trouble-shooting as detailed in the "Test instructions" column.

**B1**

Trouble-shooting

Audi 200, as of 8.83

**B2**

Trouble-shooting

Audi 200, as of 8.83



### 8.3 Procedure - trouble-shooting program

The trouble-shooting program starting on Coordinate C 7 is divided into 3 rows of boxes.

The left-hand row contains test instructions and test specifications.

The center row contains repair instructions.

The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanations of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "yes", then proceed to the next test down.

If the answer to the question is "no", branch to the center row and carry out the tests given there.

### 8.4 Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e. g. compression, valve clearance etc.).

**B3**

Trouble-shooting program

Audi 200, 8.83 →



**B4**

Trouble-shooting program

Audi 200, 8.83 →



## 8.5 Activating the self-diagnosis

### Conditions for testing:

Stop-lamp switch, tachometer, fault lamp as well as idle and full-load switches O.K.

### General:

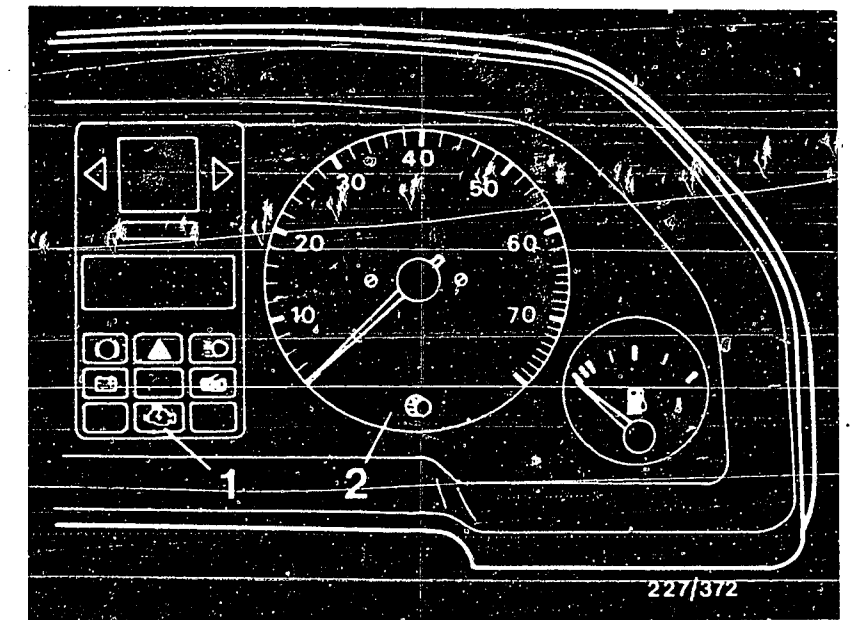
During operation, the self-diagnosis monitors the sensors which are connected to the control-unit input. If faults occur (open circuit, short circuit, overranging) the self-diagnosis, once activated, indicates these faults by means of the vehicle tachometer and the fault lamp. See top picture. Each fault is given a certain engine speed with the fault lamp "OFF or ON". The indicated faults are noted by the person performing the test and are remedied with the aid of the self-diagnosis test chart.

### Activating:

Each time before activating the self-diagnosis or after switching off the ignition, it is necessary to test-drive the vehicle on the road/chassis dynamometer (engine speed  $> 3000 \text{ min}^{-1}$  and coolant temperature  $> 50^{\circ}\text{C}$ ) in order to re-establish the fault which is then stored in the control unit. If the engine will not run, crank for at least 5 seconds. After this, do not switch off ignition.

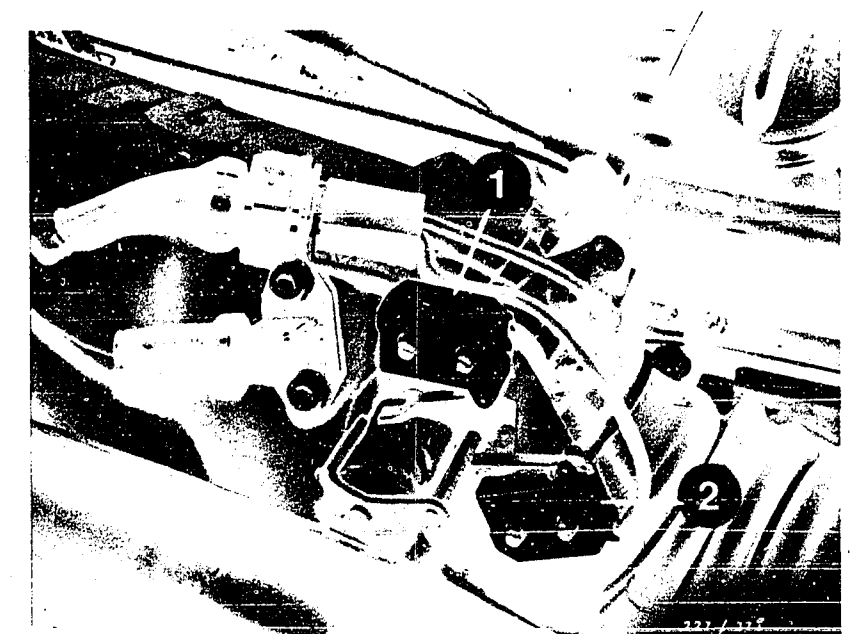
The self-diagnosis is activated with the ignition on by simultaneously closing the idle and full-load switches. The idle switch is always closed during the activation phase. The full-load switch must be closed by hand for at least 3 seconds. See bottom picture.

The tachometer now indicates  $7000 \text{ min}^{-1}$  and the fault lamp is lit (confirmation that self-diagnosis is activated).



- 1 = Fault lamp
- 2 = Tachometer

- 1 = Full-load switch
- 2 = Idle switch



**B5**

Self-diagnosis

Audi 200, as of 8.83



**B6**

Self-diagnosis

Audi 200, as of 8.83

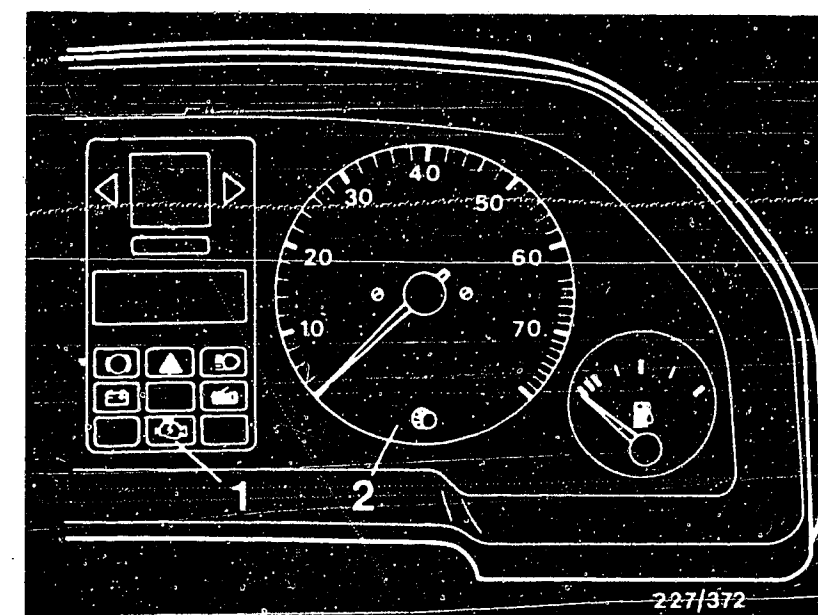




Faults which are stored in the control unit are indicated one after the other by means of the tachometer and fault lamp by pressing the brake pedal. See picture:  
When all the stored faults have been gone through, the Bosch control unit again indicates the fault which was first stored in the memory. The fault sequence can be run through as often as desired.

With the Hitachi control unit the fault memory is cleared after all faults have been gone through. The self-diagnosis must be re-activated. After remedying the cause of the fault it is absolutely necessary to test-drive the vehicle and to re-activate the self-diagnosis in order to check whether all faults have been remedied (as of vehicle series 4.84 faults are indicated as with Bosch control unit).

The following flow chart (Coordinate B9) briefly describes how to activate the self-diagnosis.



1 = Fault lamp  
2 = Tachometer

**B7**

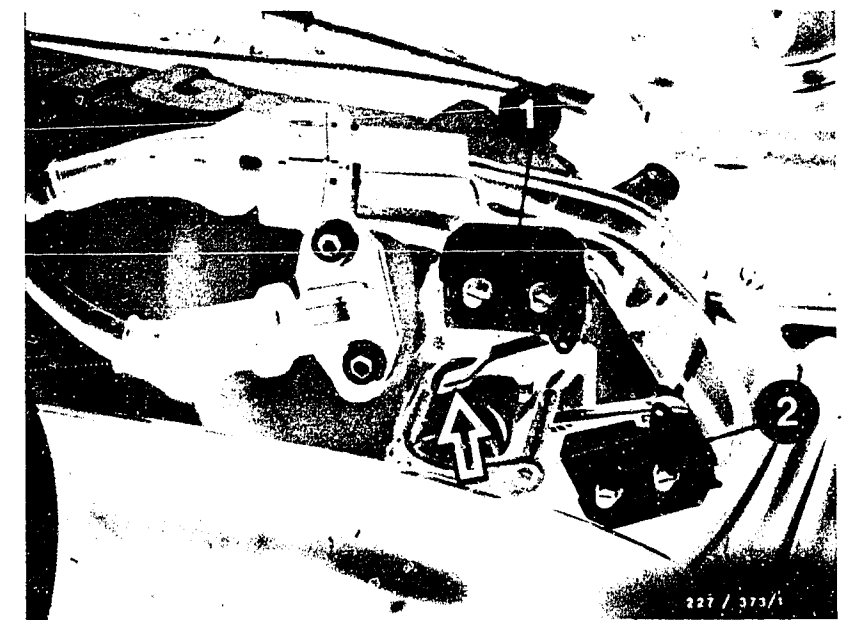
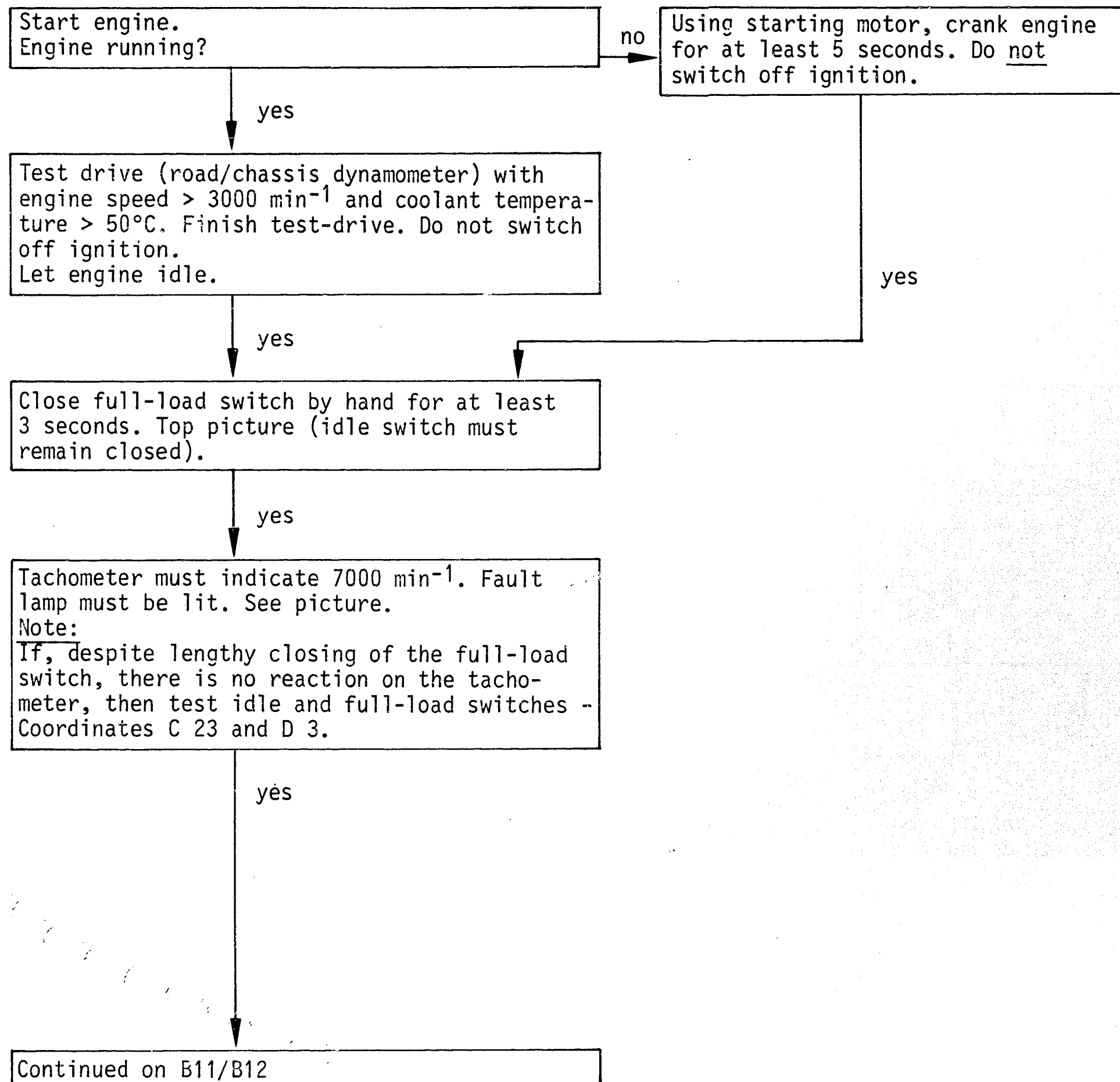
Self-diagnosis  
Audi 200, as of 8.83



**B8**

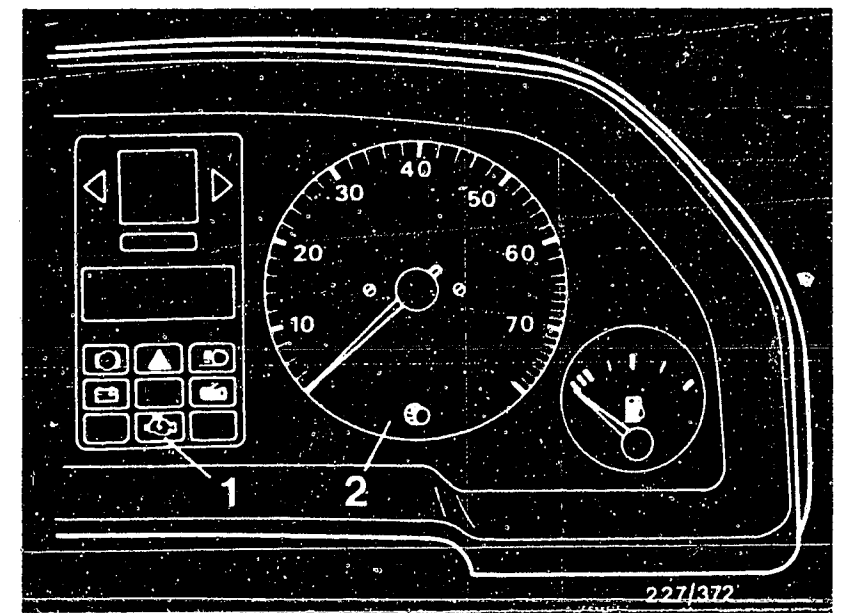
Self-diagnosis  
Audi 200, as of 8.83





1 = Full-load switch  
2 = Idle switch

1 = Fault lamp  
2 = Tachometer



**B9**

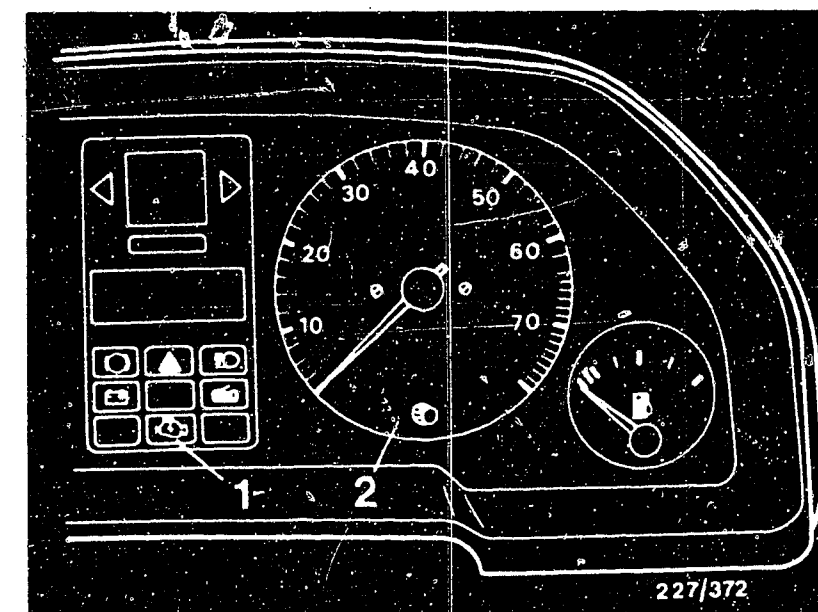
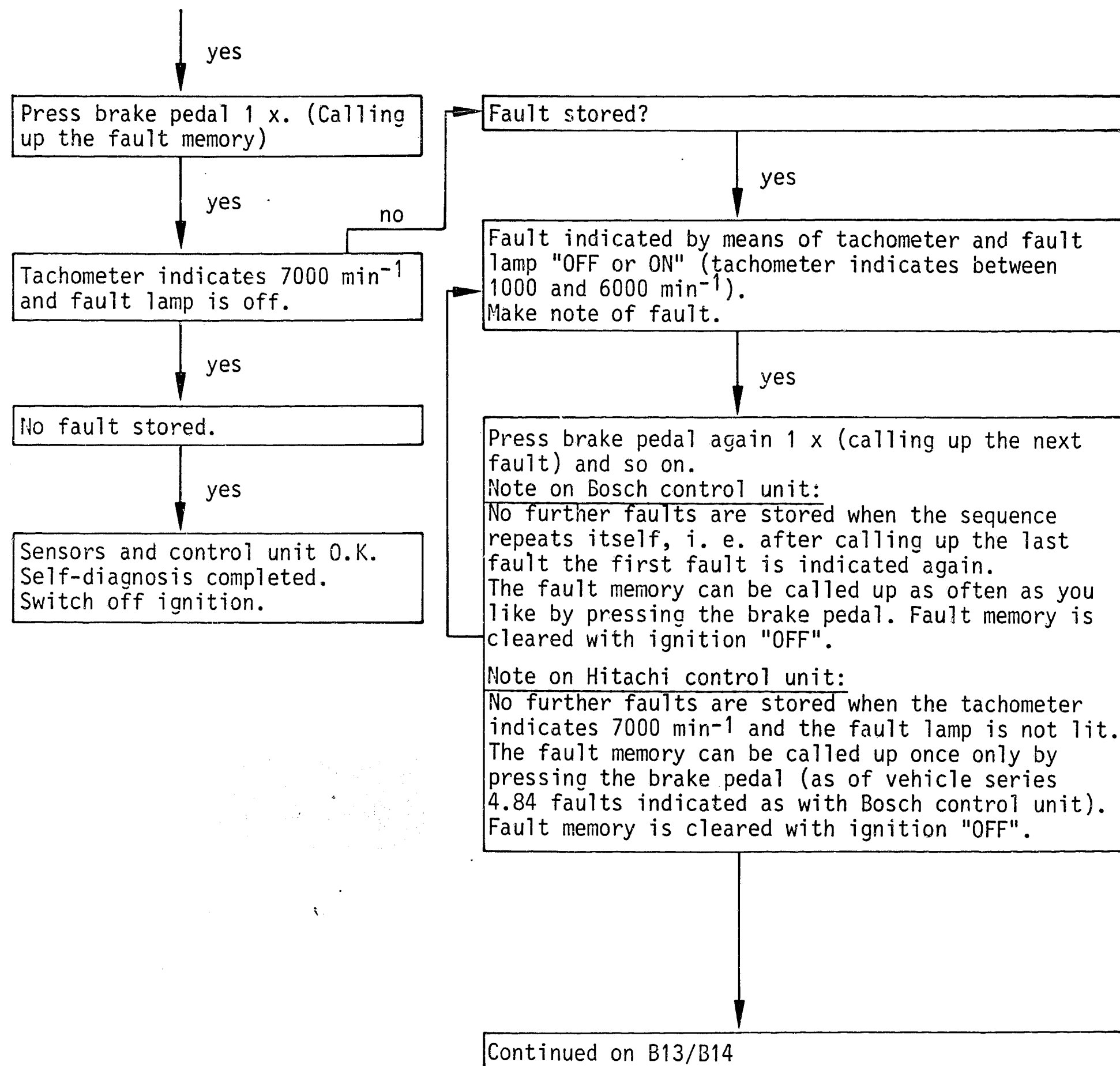
Self-diagnosis  
Audi 200, as of 8.83



**B10**

Self-diagnosis  
Audi 200, as of 8.83





1 = Fault lamp  
2 = Tachometer



Continued

Switch off ignition.  
Remedy fault(s).

yes

Whenever a fault has been remedied it is absolutely essential to test-drive the vehicle and to re-activate the self-diagnosis (check whether all faults have been remedied).

**B13**

Self-diagnosis

Audi 200, as of 8.83

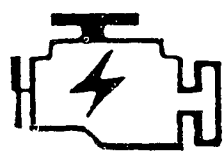


**B14**

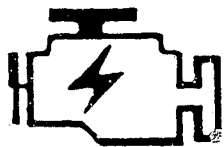
Self-diagnosis

Audi 200, as of 8.83

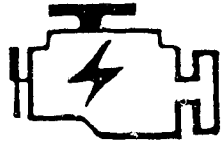


Self-diagnosis - test chart				
Fault indication		Cause of fault	Test instructions	Coordinates
Tachometer	Fault lamp			
				
1000/min	Not lit	Engine-speed sensor	Open circuit and/or short circuit in sensor lead. Engine-speed sensor defective.	F 5 ... F 11
1000/min	Lit	Knock control (engine pinging/ knocking)	Check compression pressure, valve clearance, injection system, turbocharger wastegate. Octane number of fuel too low. Bearing damage and/or abnormal engine noises.	-----
2000/min	Not lit	Reference-mark sensor	Open circuit and/or short circuit in sensor lead. Reference-mark sensor defective.	F15 ... F19
2000/min	Lit	Knock sensor	Open circuit and/or short circuit in knock sensor lead. Knock sensor defective.	D 17



Self-diagnosis - test chart				
Fault indication		Cause of fault	Test instructions	Coordinates
Tachometer	Fault lamp			
				
3000/min	Not lit	Ignition pulse generator (Hall generator)	Open circuit and/or short circuit in ignition pulse generator lead. Ignition pulse generator defective. Ignition distributor out of adjustment	F21 ... G 1 G 3
3000/min	Lit	Intake-air temperature sensor	Open circuit and/or short circuit in intake-air temperature sensor lead. Intake-air temperature sensor defective.	D 15
4000/min or 6000/min	Not lit	Pressure hose between intake manifold and control unit	Pressure hose dropped off intake manifold or control unit, pinched, broken or defective.	D 21 D 23
		Idle switch	Short circuit in idle switch and/or in wiring or idle switch sticking	C 23
4000/min	Lit	Coolant-temperature sensor	Open circuit and/or short circuit in coolant-temperature sensor lead. Coolant-temperature sensor defective.	D 13



Self-diagnosis - test chart				
Fault indication		Cause of fault	Test instructions	Coordinates
Tachometer	Fault lamp			
				
5000/min	Not lit	Control unit	Renew control unit	-----
7000/min	Not lit	All stored faults indicated, or no fault stored	-----	-----

## 8.6 Trouble-shooting chart

Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start

2. Rough idling

3. Poor throttle take-up (flat spot during acceleration)

4. Poor engine performance

5. Misfiring

6. Fuel consumption too high

7. Engine knocking

8. Backfiring

9. Engine overheating

10. Fault lamp not lit with ignition "ON" or not going out when engine idling

11. Fault lamp lighting up repeatedly while driving

												Cause of fault	Test instructions	Coordinates
•	•	•	•	•	•	•	•	•	•	•	•	Unclear	Perform detailed trouble-shooting	C 7
•	•	•	•	•	•		•					Spark plugs defective	Assess with ignition oscilloscope, or remove spark plug and make visual examination	----
•	•	•	•	•								Shunt on secondary side	Assess ignition coil, ignition distributor, ignition harness and spark plug with ignition oscilloscope or make visual examination	----
•	•	•	•	•								Open circuit on secondary side	Assess ignition coil, ignition distributor, ignition harness and spark plug with ignition oscilloscope or perform continuity test with ohmmeter	----
•												Open circuit on primary side	-----	F 3

**B21**

Trouble-shooting chart

Audi 200, as of 8.83



**B22**

Trouble-shooting chart

Audi 200, as of 8.83





# Trouble-shooting chart

Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start.

2. Rough idling

3. Poor throttle take-up (flat spot during acceleration)

4. Poor engine performance

5. Misfiring

6. Fuel consumption too high

7. Engine knocking

8. Backfiring

9. Engine overheating

10. Fault lamp not lit with ignition "ON" or not going out when engine idling

11. Fault lamp lighting up repeatedly while driving

											<u>Cause of fault</u>	<u>Test instructions</u>	<u>Coordinates</u>
		●	●	●	●						Interference-suppression resistors defective	Assess with ignition oscilloscope or by means of resistance measurement	----
●							●				Firing sequence incorrect	Firing sequence 1 - 2 - 4 - 5 - 3	----
●	●	●	●	●							Ignition coil defective	-----	C 9
								●			Fault lamp defective	-----	C 11
		●	●								Actuation of stop-lamp switch defective	-----	C 21
	●		●		●			●			Idle switch defective	-----	C 23

**B 23**

Trouble-shooting chart

Audi 200, as of 8.83



**B 24**

Trouble-shooting chart

Audi 200, as of 8.83



# Trouble-shooting chart

Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start.

2. Rough idling

3. Poor throttle-take-up (flat spot during acceleration)

4. Poor engine performance

5. Misfiring

6. Fuel consumption too high

7. Engine knocking

8. Backfiring

9. Engine overheating

10. Fault lamp not lit with ignition "ON" or not going out when engine idling

11. Fault lamp lighting up repeatedly while driving

Cause of fault

Test instructions

Coordinates

		●	●		●						Full-load switch defective	-----	D 3
●											Energization of fuel pump relay defective	-----	D 7
●				●							Ignition distributor out of adjustment	-----	D 9
						●				●	Coolant-temperature sensor defective	-----	D 13
			●							●	Intake-air temperature sensor defective	-----	D 15
			●		●					●	Knock sensor defective	-----	D 17

**C1**

Trouble-shooting chart

Audi 200, as of 8.83



**C2**

Trouble-shooting chart

Audi 200, as of 8.83



# Trouble-shooting chart

Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start.
2. Rough idling
3. Poor throttle-take-up (flat spot during acceleration)
4. Poor engine performance
5. Misfiring
6. Fuel consumption too high
7. Engine knocking
8. Backfiring
9. Engine overheating
10. Fault lamp not lit with ignition "ON" or not going out when engine idling
11. Fault lamp lighting up repeatedly while driving

											<u>Cause of fault</u>	<u>Test instructions</u>	<u>Coordinates</u>
	●	●	●		●	●		●		●	Control unit pressure hose defective	-----	D 21
		●	●		●	●				●	Control unit pressure sensor defective	-----	D 23
	●	●	●		●	●		●		●	Spark advance angle incorrect	-----	E 1
		●			●						Actuation of overrun-cutoff valve defective	-----	E 3
		●			●						Actuation of two-way valve defective	-----	E 7
	●	●	●					●			Actuation of vacuum-control valve (exhaust-gas recirculation) defective	-----	E 11

**C3**

Trouble-shooting chart

Audi 200, as of 8.83



**C4**

Trouble-shooting chart

Audi 200, as of 8.83



# Trouble-shooting chart

## Customer complaint (fault system)

1. Starting motor operates, engine fails to start.
2. Rough idling
3. Poor throttle-take-up (flat spot during acceleration)
4. Poor engine performance
5. Misfiring
6. Fuel consumption too high
7. Engine knocking
8. Backfiring
9. Engine overheating
10. Fault lamp not lit with ignition "ON" or not going out when engine idling
11. Fault lamp lighting up repeatedly while driving

											<u>Cause of fault</u>	<u>Test instructions</u>	<u>Coordinates</u>
●											Control unit power supply defective	-----	F 1
●										●	Engine-speed sensor defective	-----	F 5...F11
●										●	Reference-mark sensor defective	-----	F13...F19
●										●	Ignition pulse generator defective	-----	F21...G 1
●											Power output stage defective	-----	G 7

**C5**

Trouble-shooting chart

Audi 200, as of 8.83



**C6**

Trouble-shooting chart

Audi 200, as of 8.83



## 8.7 Trouble-shooting program

Test primary signal. If no oscilloscope or tachometer available, check whether ignition spark across spark gap.

### Primary signal testing with oscilloscope

Connect oscilloscope to ignition coil as per operating instructions.

Start engine.

Oscilloscope must indicate a primary voltage (of any value).

### Primary signal testing with tachometer

Connect tachometer to ignition coil as per operating instructions.

Start engine.

Tachometer must indicate a reading (of any value).

### Ignition spark testing with spark gap

Remove H.T. ignition cable terminal 4 from ignition coil.

Connect spark gap including sleeve-type suppressor

(5 k $\Omega$ ) to ignition coil.

Adjust spark gap to 5 mm.

Start engine.

There must be sparks across the spark gap.

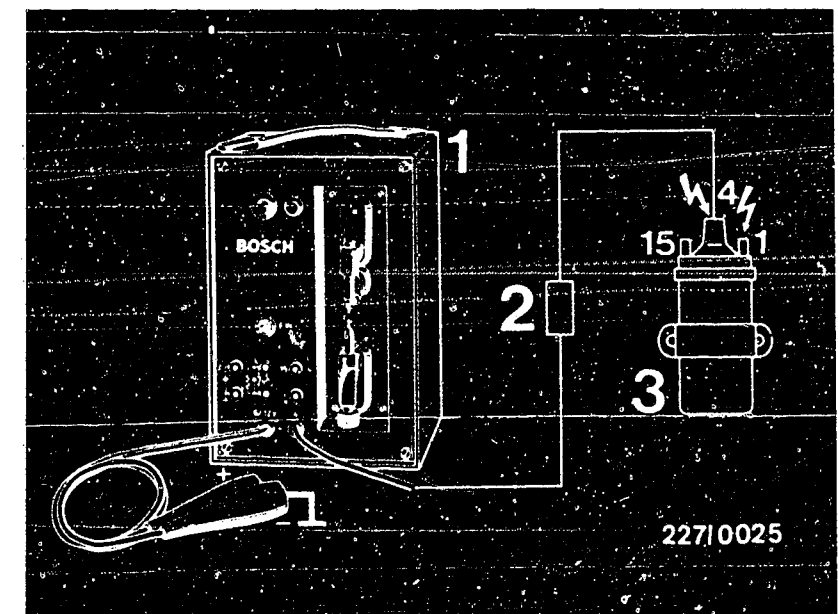
Primary signal present or ignition sparks across spark gap?

yes

Continued on C 9 / C 10

If no primary signal or no ignition spark, continue testing at F 1.

Tests from C 9 onwards not necessary.



- 1 = Spark gap
- 2 = 5 k $\Omega$  sleeve-type suppressor
- 3 = ignition coil version 1

⚡ = dangerous voltages  
(400 V - 25 kV)

3a = Ignition coil - version 2



**C7**

Trouble-shooting program

Audi 200, as of 8.83

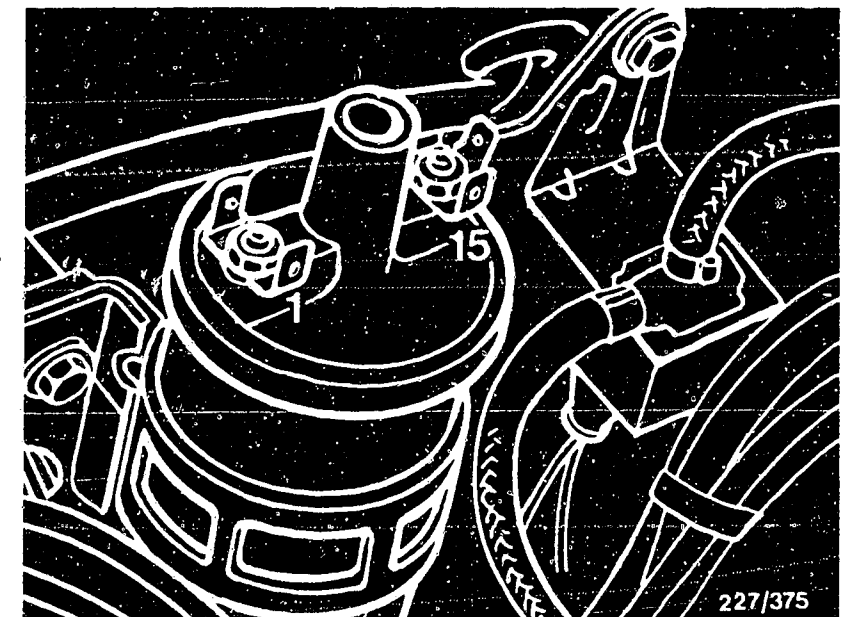
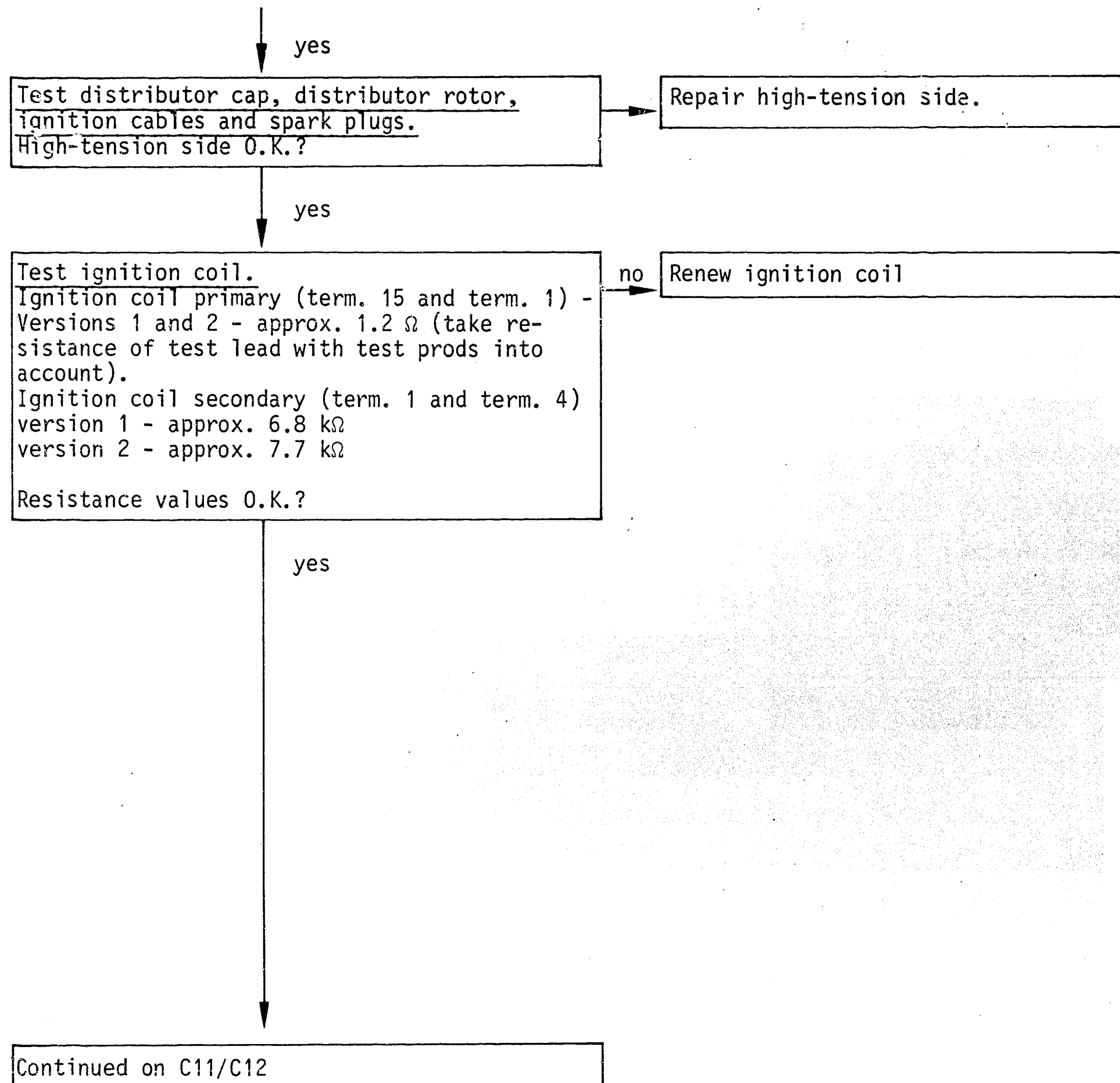


**C8**

Trouble-shooting program

Audi 200, as of 8.83

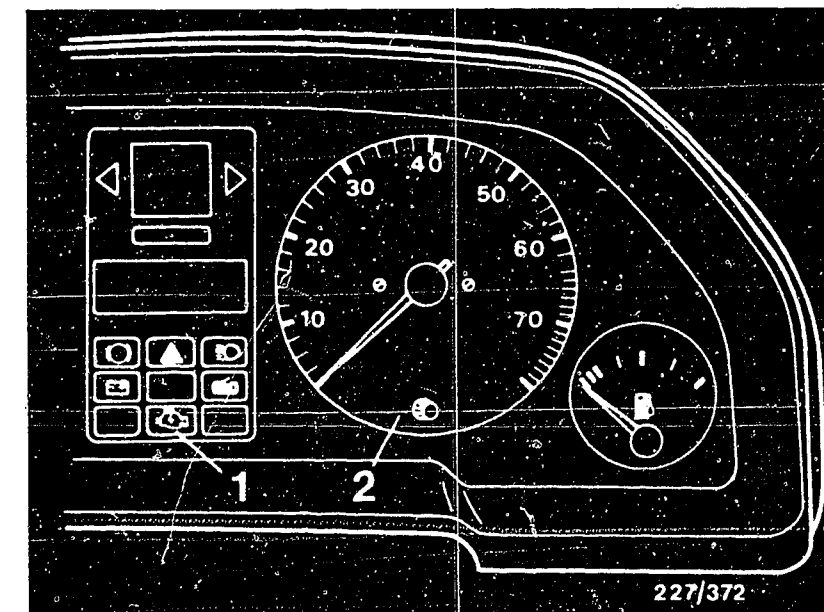
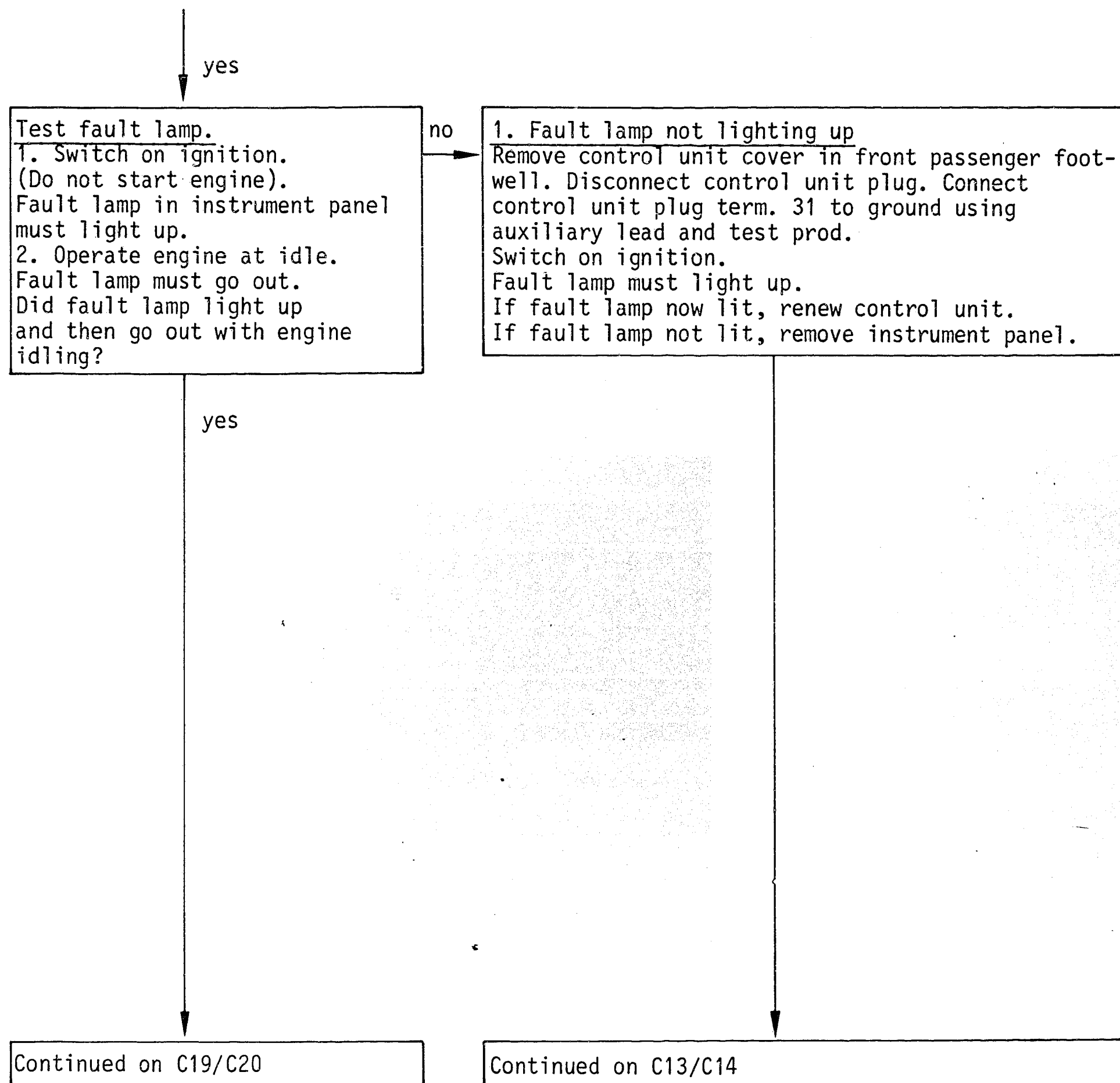




Ignition coil - version 1

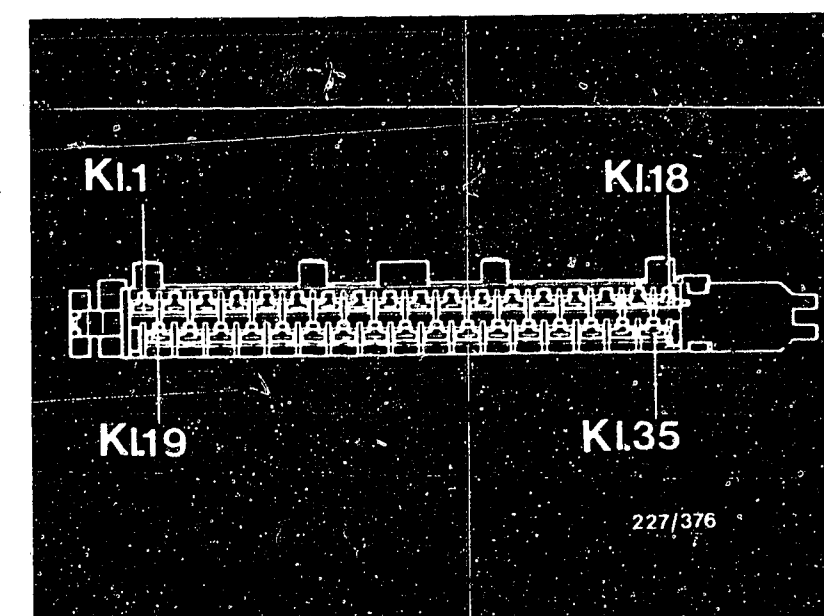
3a = Ignition coil - version 2





1 = Fault lamp  
2 = Tachometer

Control unit plug



**C11**

Trouble-shooting program  
Audi 200, as of 8.83



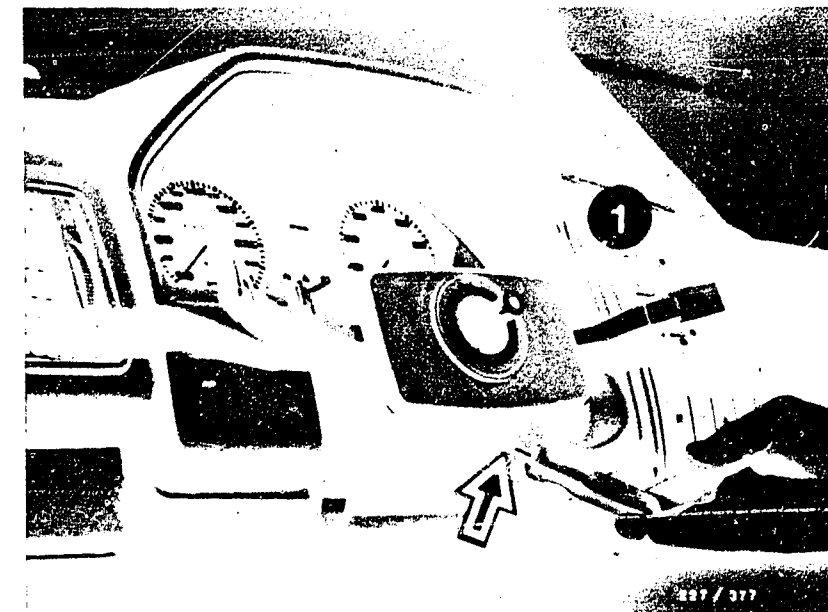
**C12**

Trouble-shooting program  
Audi 200, as of 8.83



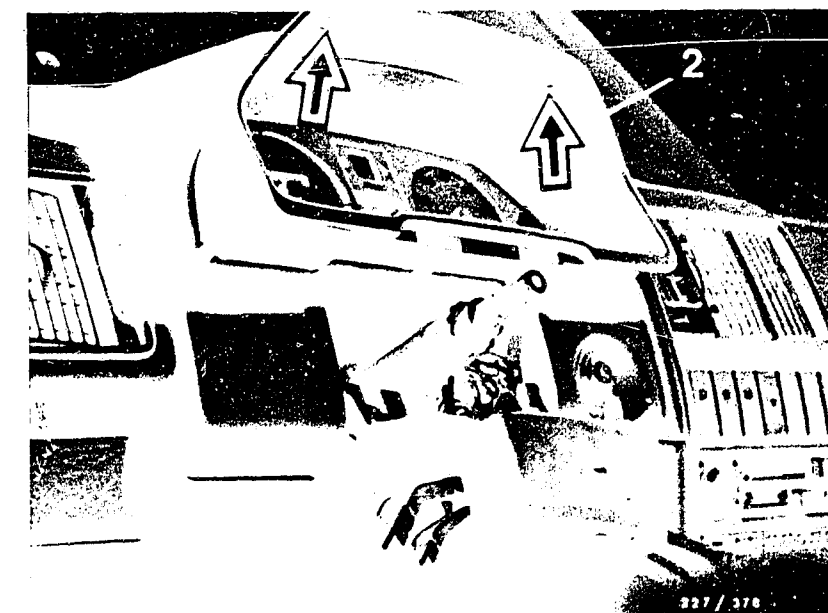
Continued

Disconnect battery ground strap.  
Remove steering wheel cap by pulling upward.  
Unscrew and remove steering wheel (installing the steering wheel: tightening torque 40 Nm).  
Using screwdriver, undo clamp fastening of steering-column switch.  
See arrow in top picture.  
Remove steering-column switch from steering column tube.  
Unscrew instrument panel fasteners and withdraw.  
See arrows in bottom picture.



1 = Steering-column switch

2 = Instrument panel



yes

Continued on C19/C20

Continued on C15/C16

**C13**

Trouble-shooting program  
Audi 200, as of 8.83



**C14**

Trouble-shooting program  
Audi 200, as of 8.83





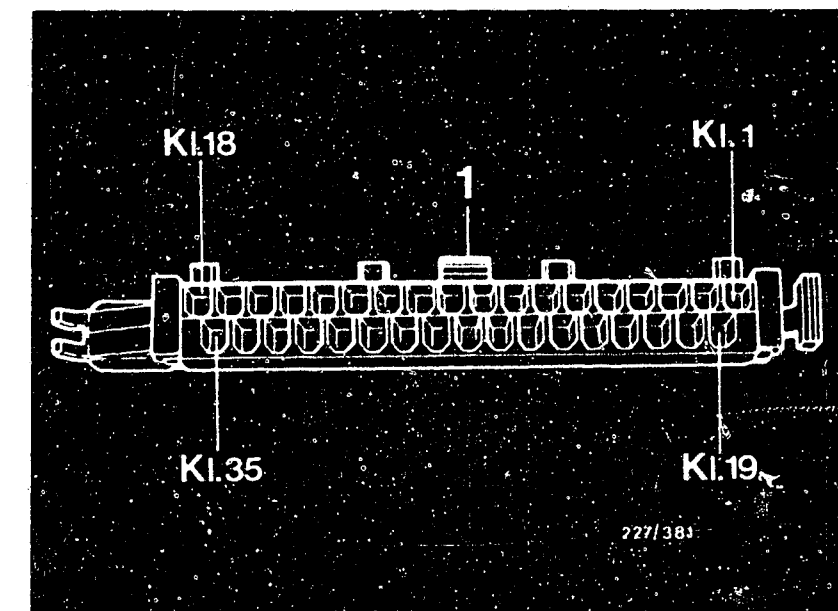
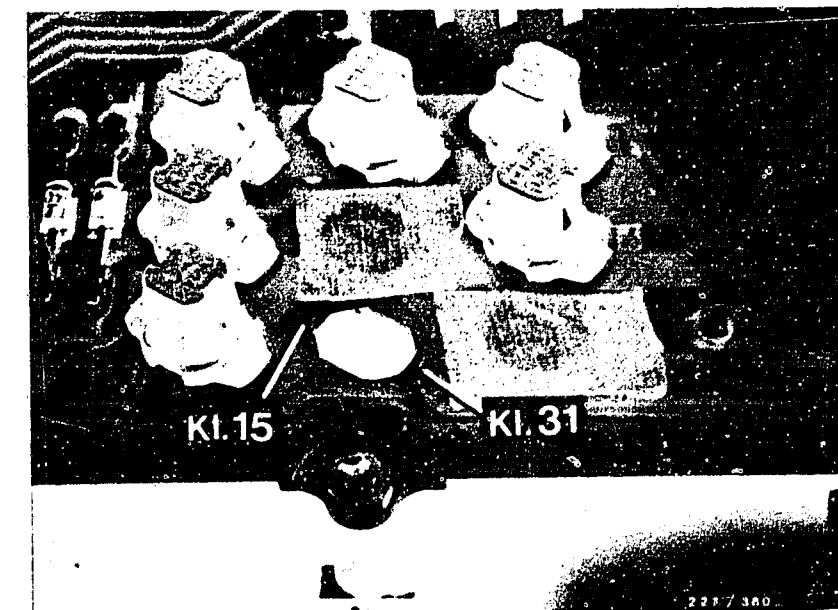
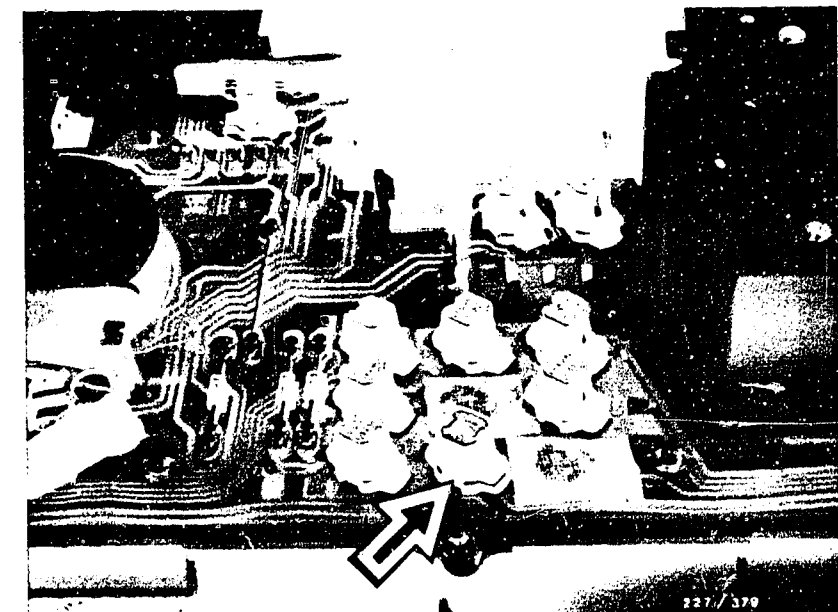
Continued

Remove fault lamp from instrument panel. See arrow in top picture.  
Apply 12 V to see if fault lamp operates.  
If fault lamp was O.K., connect battery ground strap and connect control-unit plug (1).  
Connect voltmeter to conductive foil term. 15 and term. 31. See centre picture.  
Ignition on.  
Voltmeter must indicate battery voltage. If battery voltage not indicated, test for open circuit in leads from ignition and starting switch term. 15 to fault lamp term. 15 and in lead from fault lamp term. 31 to control unit plug (1) term. 31.  
Eliminate open circuit.

yes

Continued on C19/C20

Continued on C17/C18



Continued

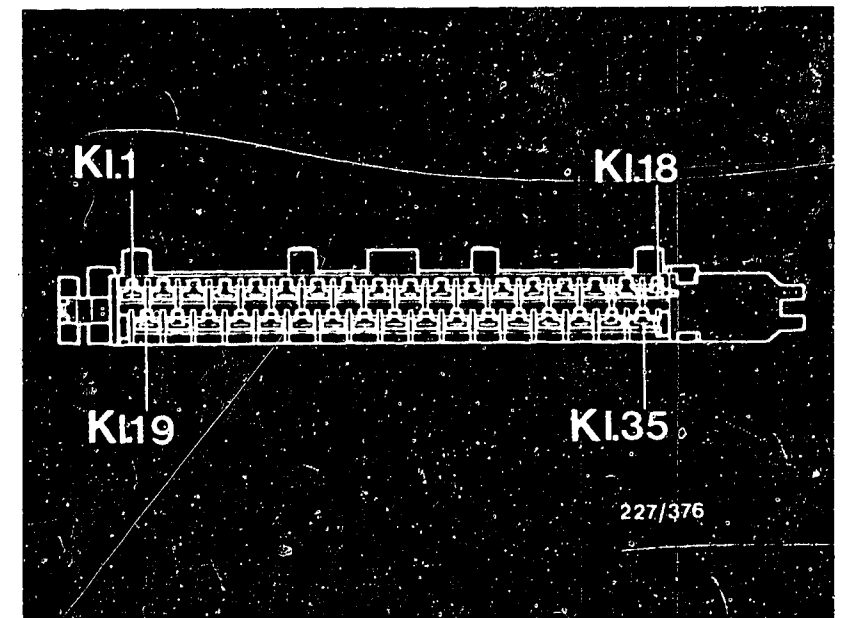
2. Fault lamp permanently lit

Disconnect control unit plug.

Switch on ignition.

If fault lamp no longer lit, renew control unit.

If fault lamp still lit, eliminate short circuit to ground in fault lamp and/or in connecting lead term. 31.

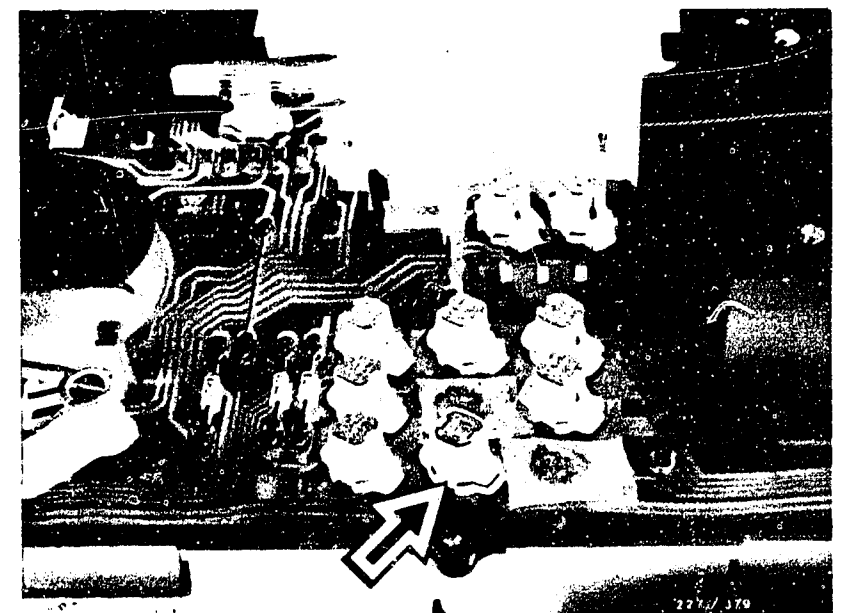


Control unit plug

yes

Continued on C19/C20

Arrow = Fault lamp



**C17**

Trouble-shooting program

Audi 200, as of 8.83

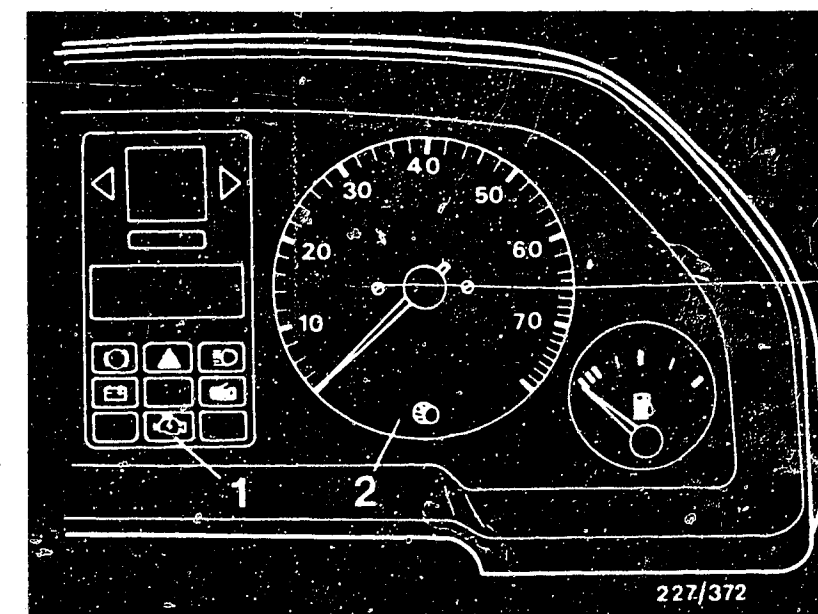
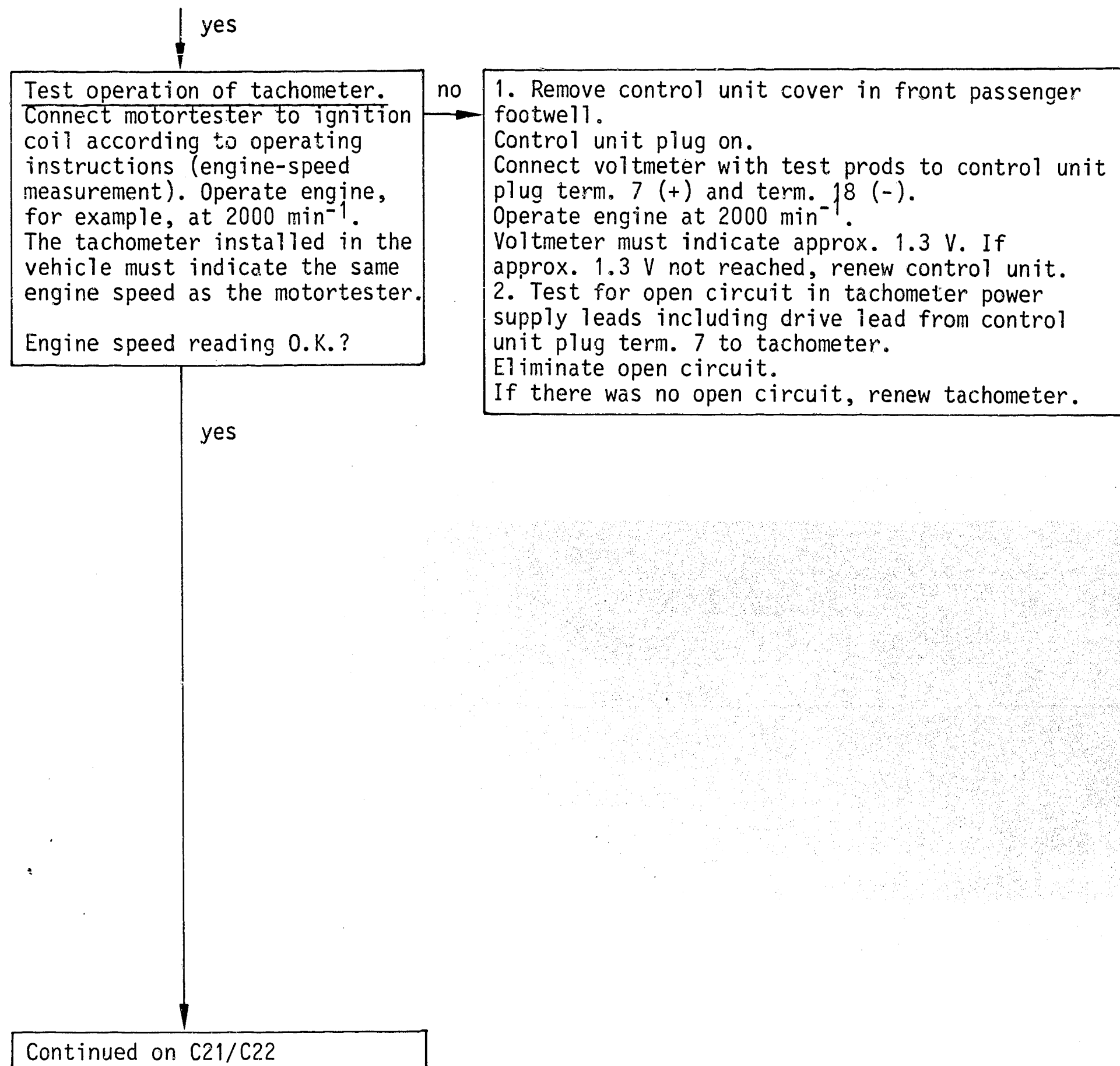


**C18**

Trouble-shooting program

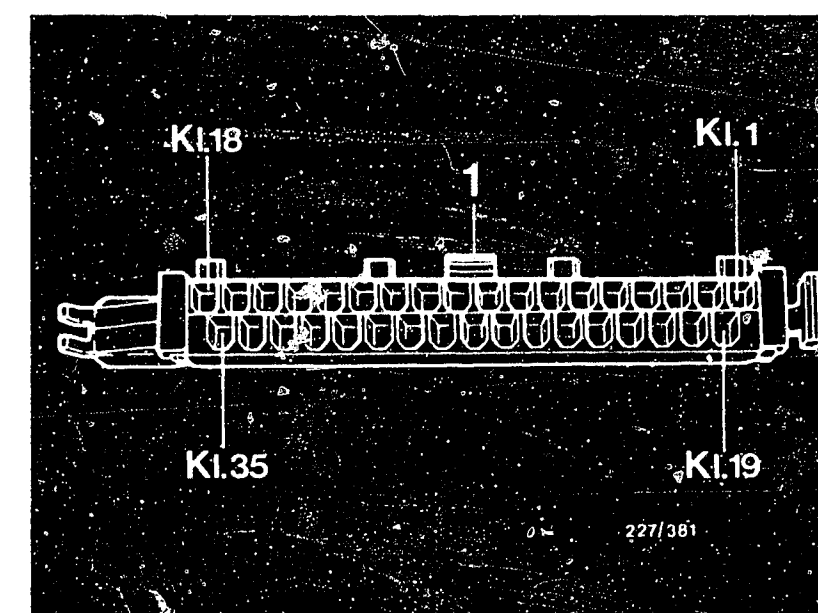
Audi 200, as of 8.83





1 = Fault lamp  
2 = Tachometer

1 = Control unit plug



**C19**

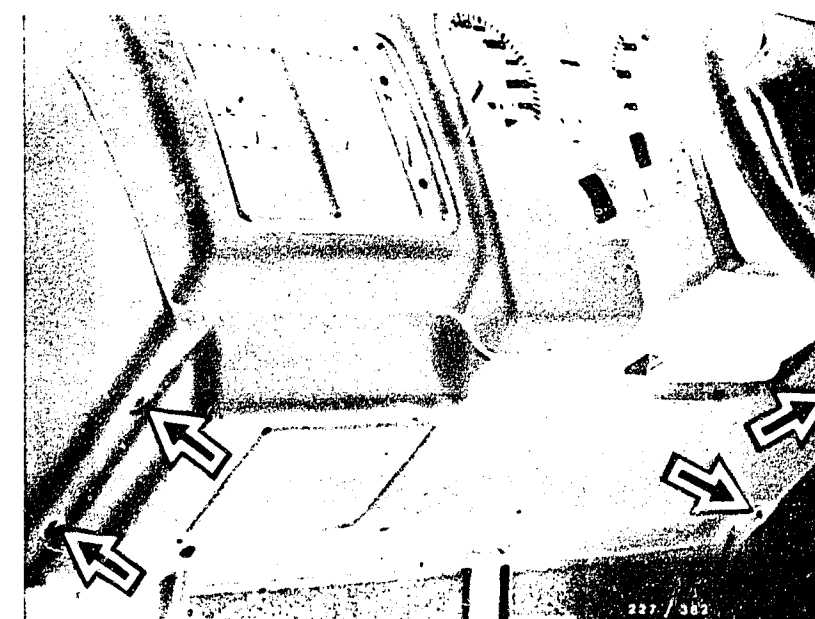
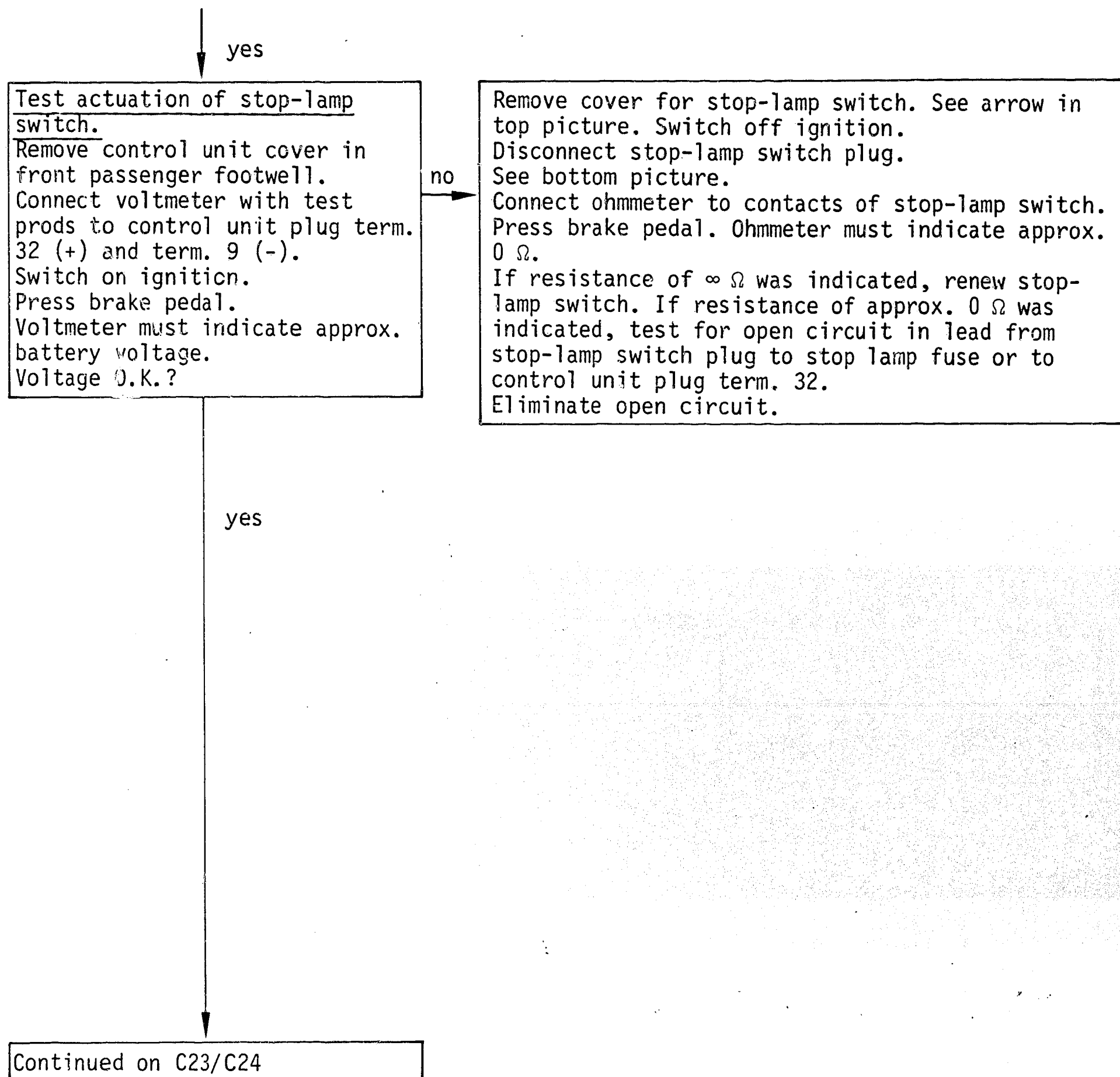
Trouble-shooting program  
Audi 200, as of 8.83



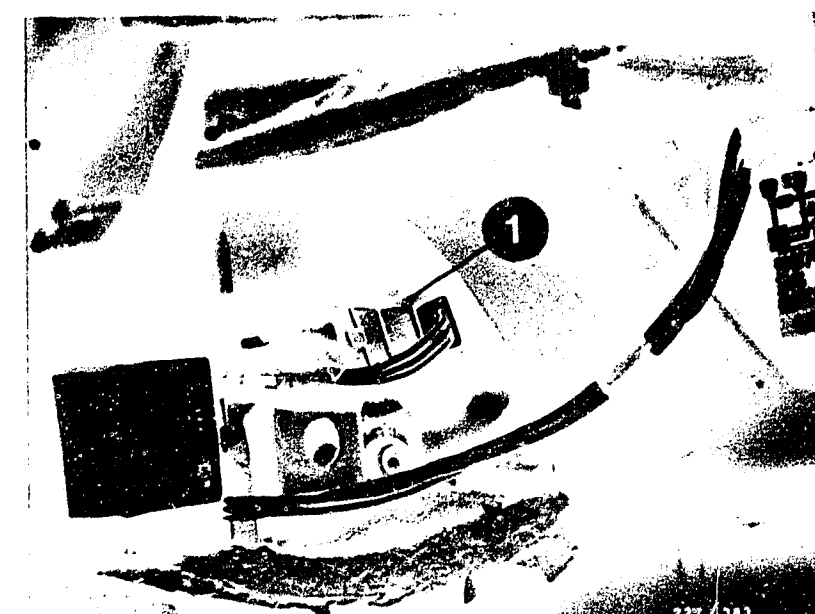
**C20**

Trouble-shooting program  
Audi 200, as of 8.83





1 = Stop-lamp switch



**C21**

Trouble-shooting program  
Audi 200, as of 8.83



**C22**

Trouble-shooting program  
Audi 200, as of 8.83



yes

### Test idle switch.

Remove control unit cover in front passenger footwell and idle switch cover.

Disconnect control unit plug. See top picture.

Connect voltmeter with test prods to disconnected control unit plug term. 20 (+) and term. 18 (-).

Switch on ignition.

Throttle valve is in idle position (idle switch closed).

The voltmeter must indicate approx. battery voltage.

Open throttle valve 1...2° (idle switch open).

Voltmeter must indicate 0 V.

Voltages O.K.?

yes

Continued on D3/D4

no

### Switch off ignition.

Disconnect idle and full-load switch plug. See arrow in centre picture.

Connect ohmmeter with test prods to plug connector of idle and full-load switch term. 15 and term. 20. See centre picture.

Throttle valve is in idle position.

Ohmmeter must indicate approx. 0  $\Omega$ .

Open throttle valve 1°...2°.

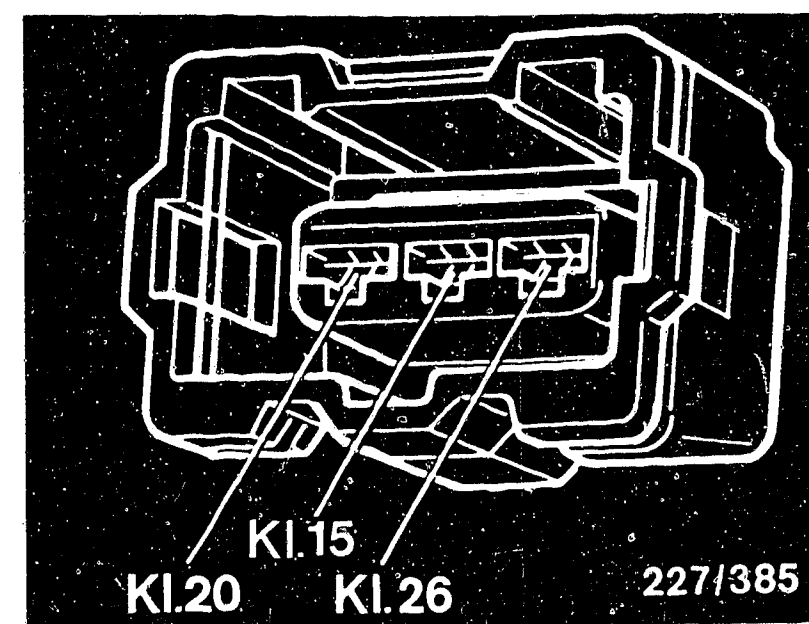
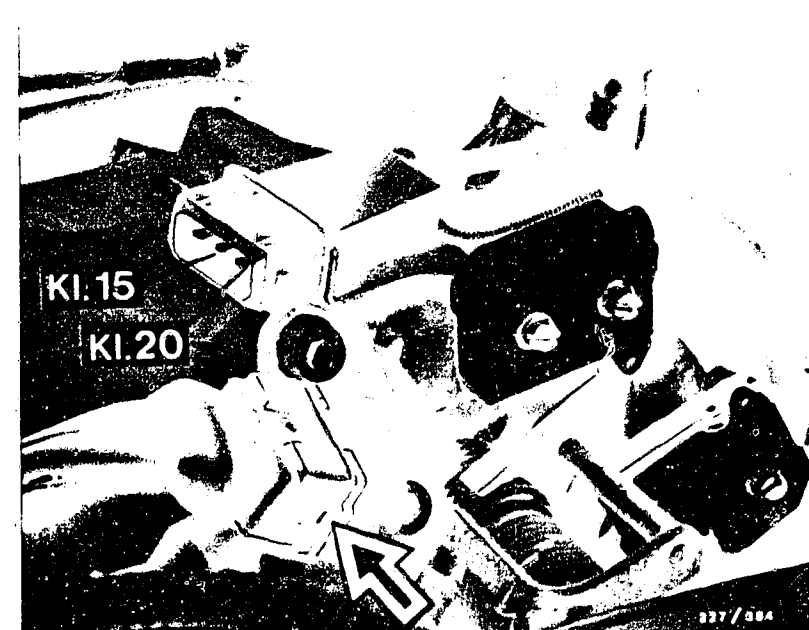
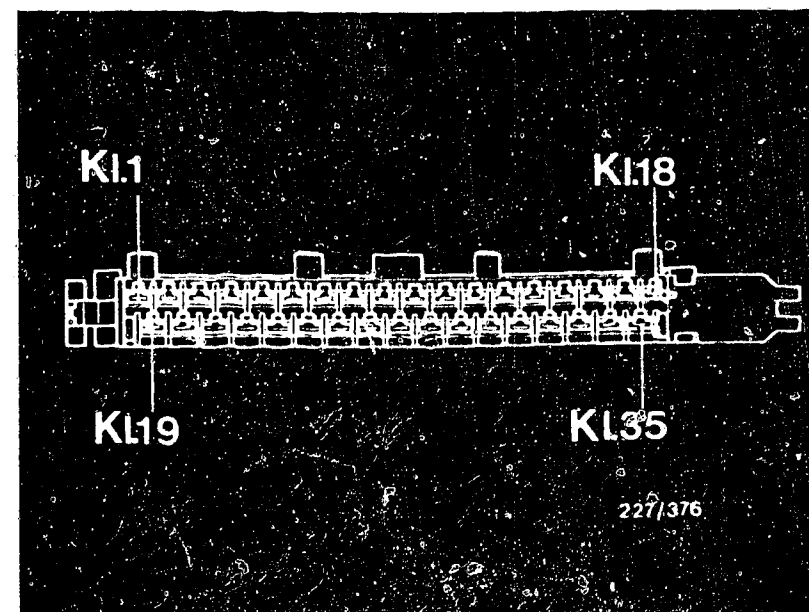
Ohmmeter must indicate  $\infty \Omega$ .

If resistance values O.K., test for open circuit in lead from idle and full-load switch plug (bottom picture) term. 15 to ignition and starting switch term. 15 and in lead from idle and full-load switch plug term. 20 to control unit plug term. 20.

Eliminate open circuit.

If resistance values not O.K., adjust idle switch.

Continued on D1/D2



**C23**

Trouble-shooting program

Audi 200, as of 8.83



**C24**

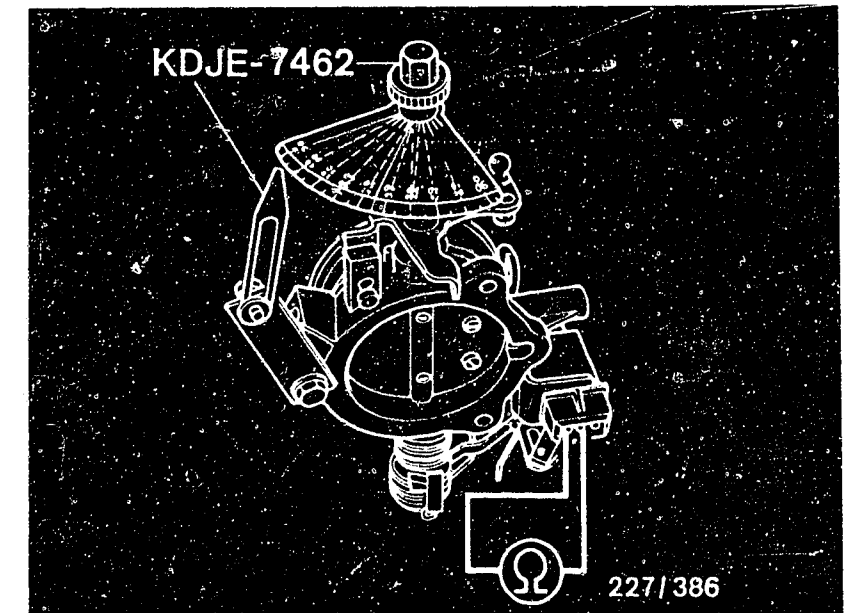
Trouble-shooting program

Audi 200, as of 8.83



Continued

To adjust the idle switch, remove throttle-valve part.  
Mount pointer for angle measuring device on throttle valve part.  
Screw graduated disc onto throttle shaft, if necessary unscrewing fastening nut for throttle lever.  
Connect ohmmeter to plug connector of idle switch. See picture.  
Set graduated disc to 0 degrees.  
Open throttle valve approx. 20° and close again slowly.  
2.5° - 1° before final position of throttle valve ohmmeter must indicate approx. 0 Ω.  
If necessary, adjust or renew idle switch.



yes

Continued on D3/D4

**D1**

Trouble-shooting program

Audi 200, as of 8.83



**D2**

Trouble-shooting program

Audi 200, as of 8.83



yes

**Test full-load switch.**  
Remove control unit cover in front passenger footwell and cover for full-load switch. Disconnect control unit plug. See top picture.  
Connect voltmeter with test prods to disconnected control unit plug term. 26 (+) and term. 18 (-). Switch on ignition. Throttle valve is in idle position (full-load switch open). The voltmeter must indicate 0 V. Open throttle valve fully (full-load switch closed). Voltmeter must indicate approx. battery voltage.  
Voltages O.K.?

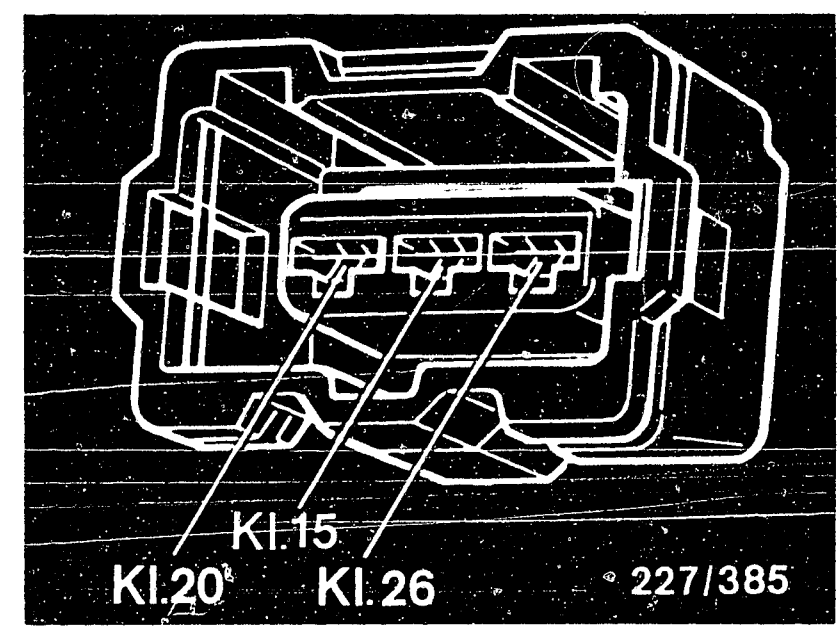
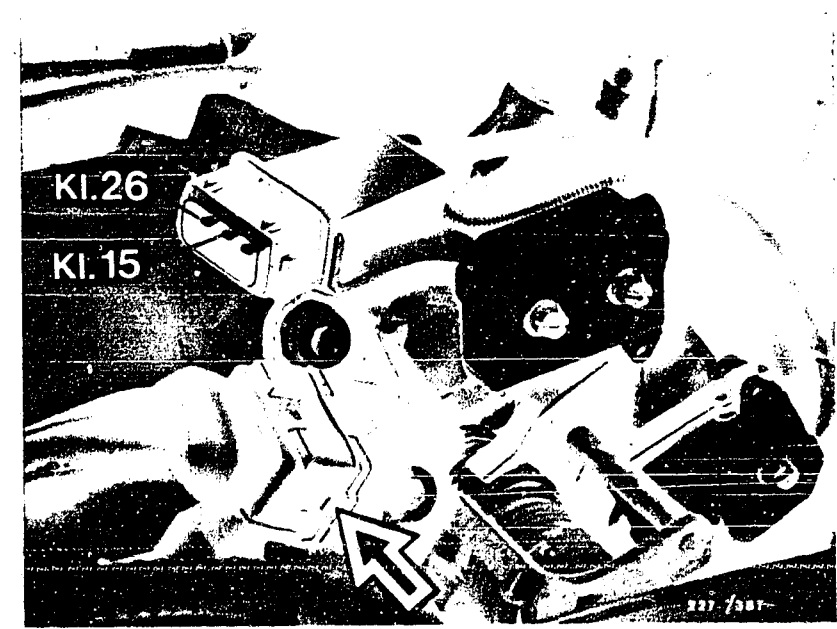
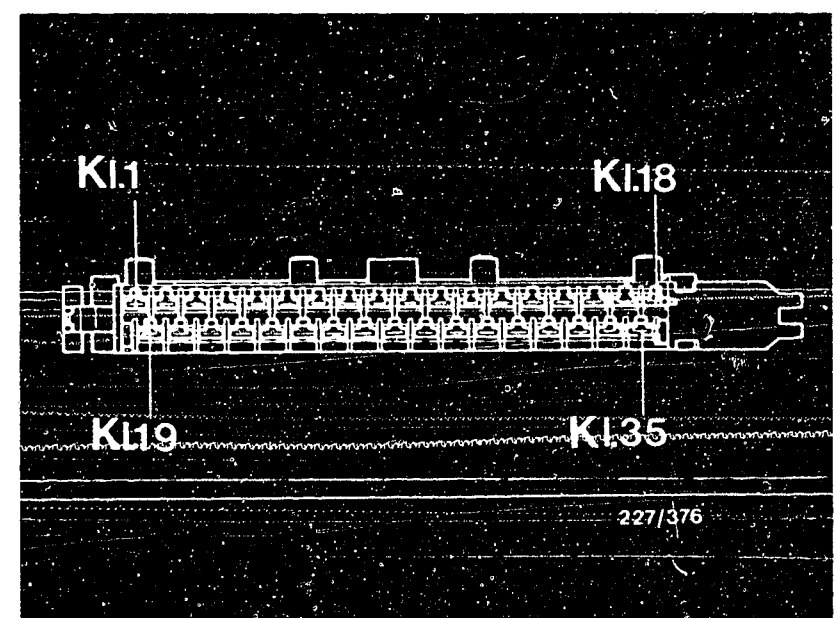
yes

Continued on D7/D 8

no

Switch off ignition.  
Disconnect idle and full-load switch plug. See arrow in centre picture.  
Connect ohmmeter to plug connector of idle and full-load switch term. 15 and term. 26. See centre picture.  
Throttle valve is in idle position.  
Ohmmeter must indicate  $\infty \Omega$ . Open throttle valve fully. Ohmmeter must indicate approx. 0  $\Omega$ .  
If resistance value O.K., test for open circuit in lead from idle and full-load switch plug (bottom picture) term. 15 to ignition and starting switch term. 15 and in lead from idle and full-load switch plug term. 26 to control unit plug term. 26.  
Eliminate open circuit.  
If resistance value not O.K., adjust full-load switch.

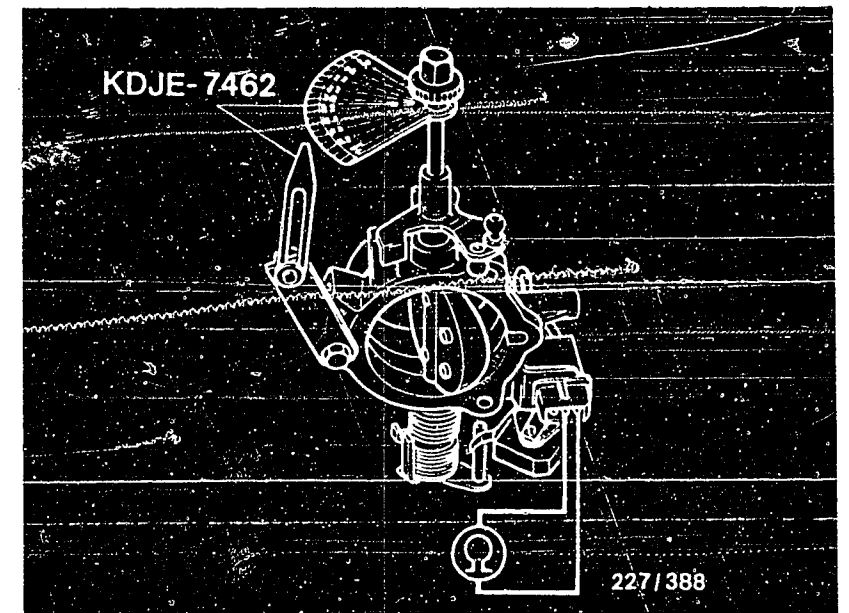
Continued on D5/D6





Continued

To adjust the full-load switch, remove throttle-valve part.  
Mount pointer for angle measuring device on throttle valve part. Screw graduated disc onto throttle shaft, if necessary unscrewing fastening nut for throttle lever.  
Connect ohmmeter to plug connector of full-load switch.  
See picture.  
Set graduated disc to 0 degrees.  
Slowly open throttle valve.  
50° - 55° after idle position ohmmeter must indicate approx. 0 Ω. If necessary, adjust or renew full-load switch.



yes

Continued on D7/D8

**D5**

Trouble-shooting program  
Audi 200, as of 8.83



**D6**

Trouble-shooting program  
Audi 200, as of 8.83





yes

Test energization of electric fuel pump relay.

Control unit plug connected.

Remove cover from central-electrics console.

Remove electric fuel pump relay from relay board.

See arrow in top picture.

Connect voltmeter with test prods to relay base term. 46 (+) and term. 47 (-).

See arrows in centre picture.

Briefly operate starting motor.

Voltmeter must indicate approx. 9 V.

Voltage O.K.?

no

1. Connect voltmeter with test prod to relay base term. 46 (+) and ground.

Switch on ignition.

Voltmeter must indicate approx. battery voltage.

If battery voltage not indicated, eliminate open circuit between relay base term. 46 and ignition/starting switch term. 15.

2. Remove control unit cover in front passenger footwell.

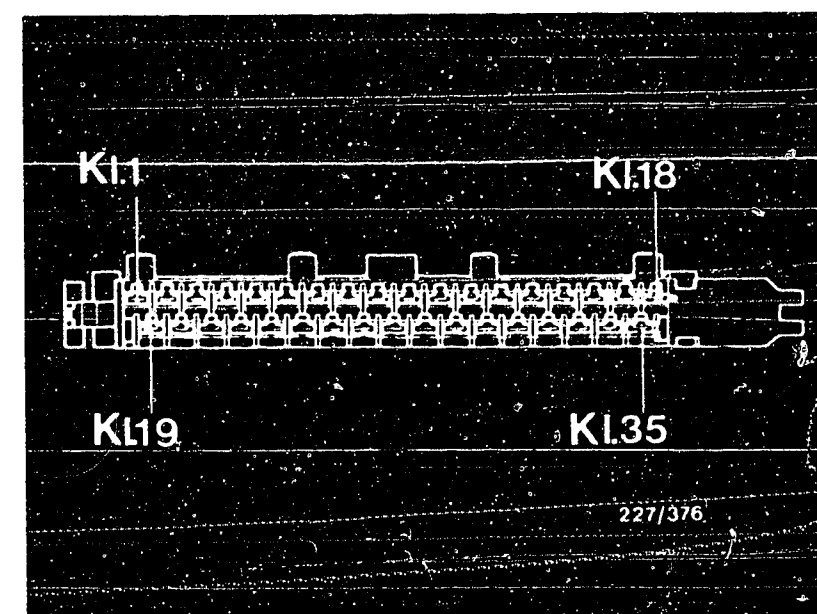
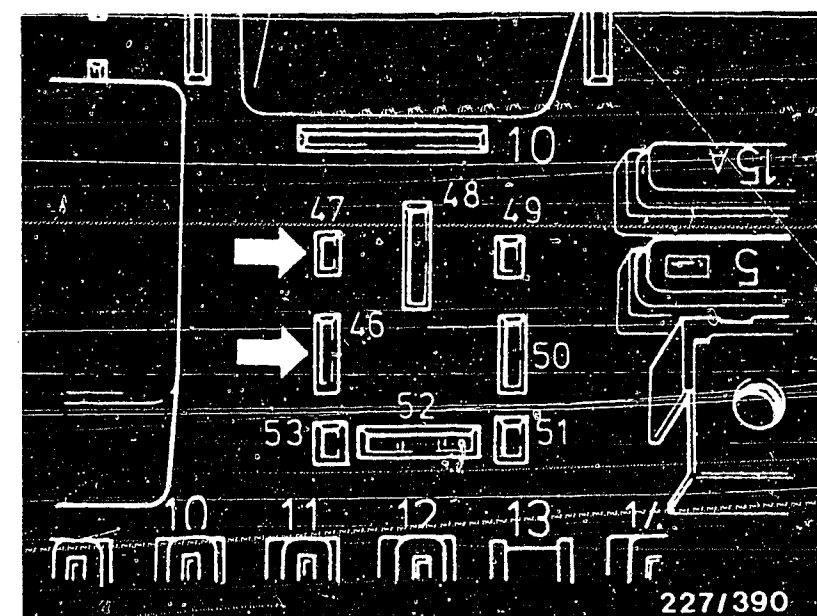
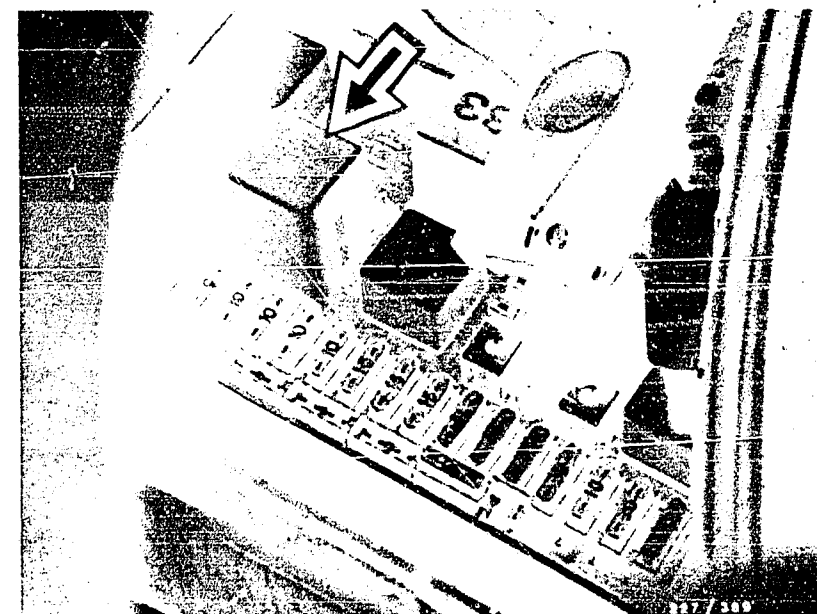
Test for open circuit in lead from relay base term. 47 to control unit plug term. 21.

Eliminate open circuit.

If there was no open circuit in 1. and 2., renew control unit.

yes

Continued on D9/D10



D7

Trouble-shooting program

Audi 200, as of 8.83



D8

Trouble-shooting program

Audi 200, as of 8.83



yes

Test ignition distributor adjustment.

Set crankshaft cyl. 1 to TDC.  
See top picture for mark.

At the same time, mark on camshaft gear must align with top edge of valve cover gasket.  
See arrow in centre picture.

Remove cap and dust-protection cover from ignition distributor.

Mark on trigger wheel must align with mark on ignition distributor housing. See arrow in bottom picture.

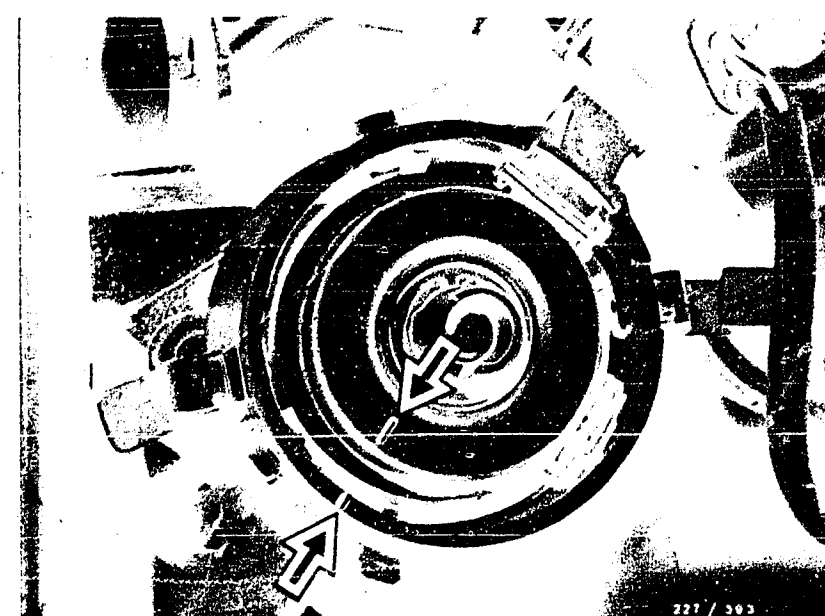
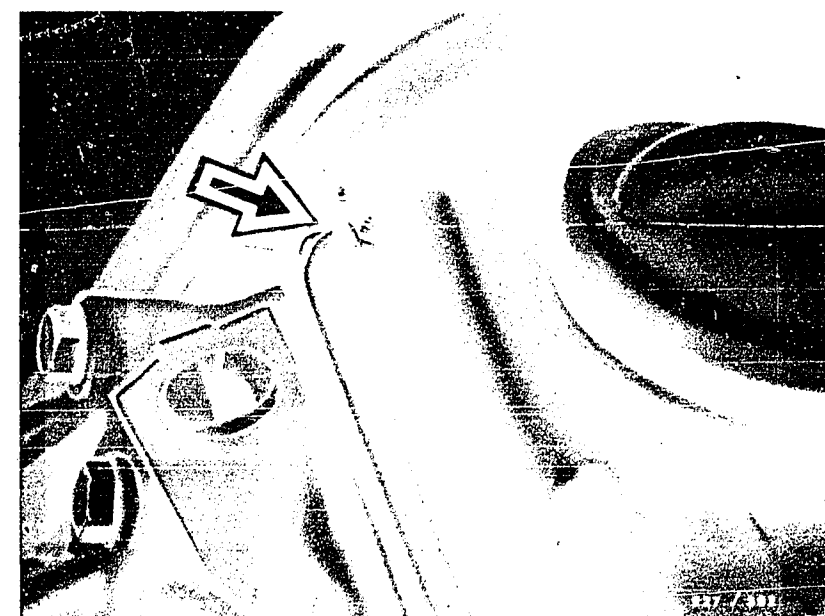
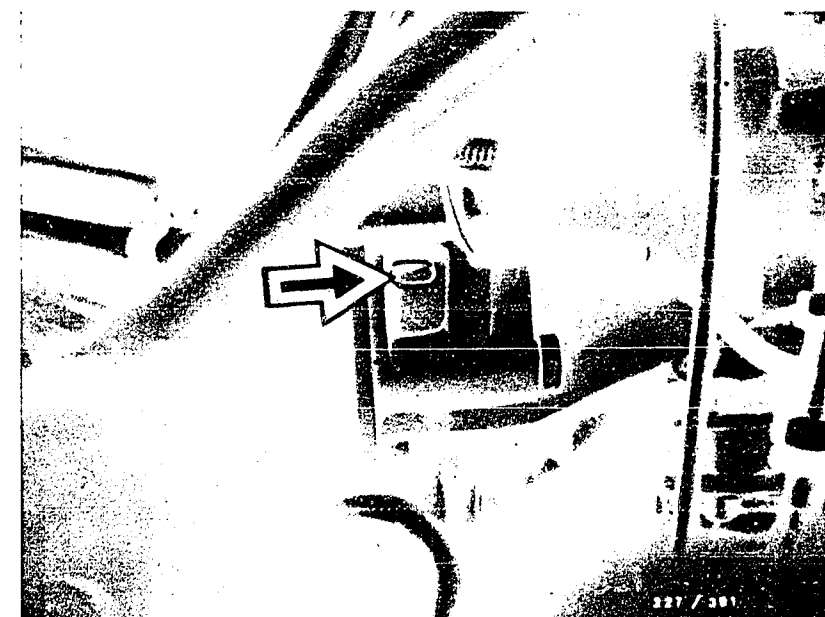
Ignition distributor adjustment O.K.?

no

Adjust ignition distributor.

yes

Continued on D11/D12



**D9**

Trouble-shooting program

Audi 200, as of 8.83

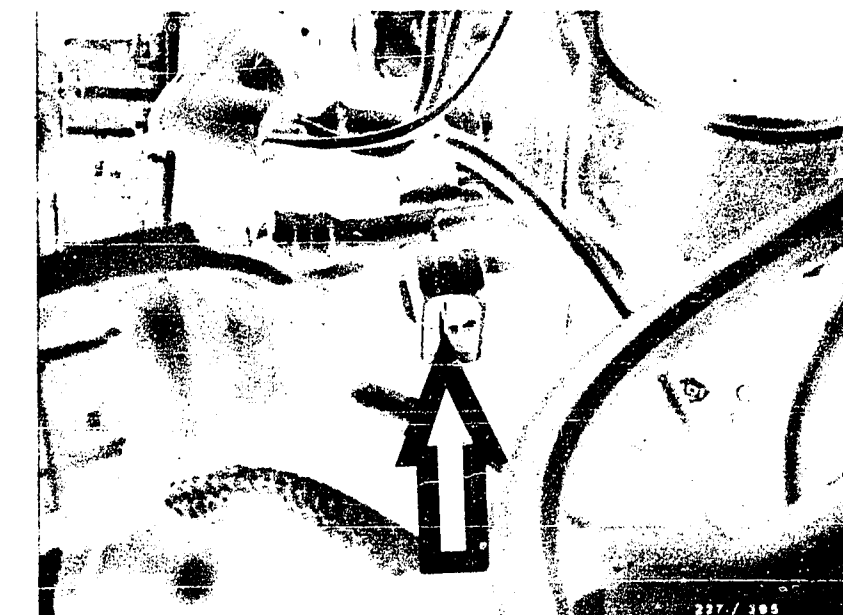
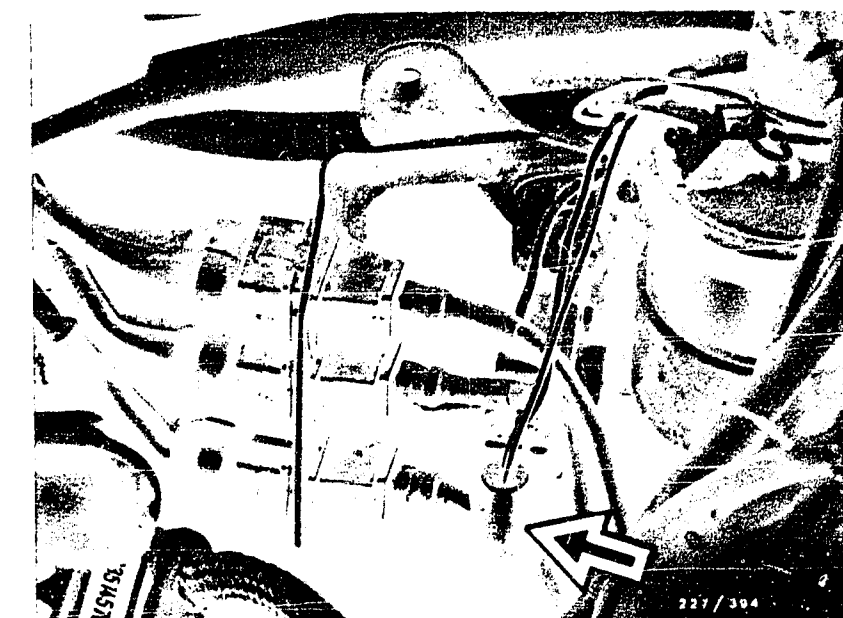
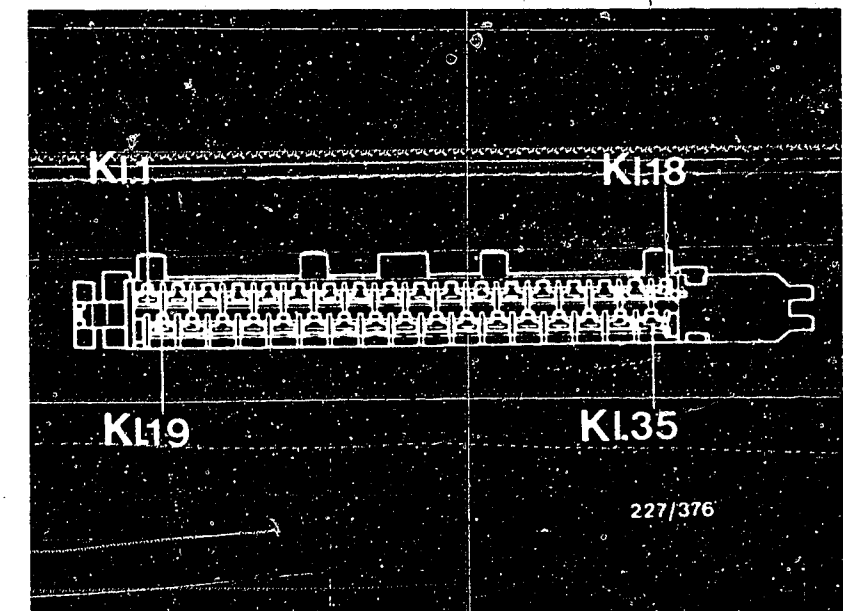
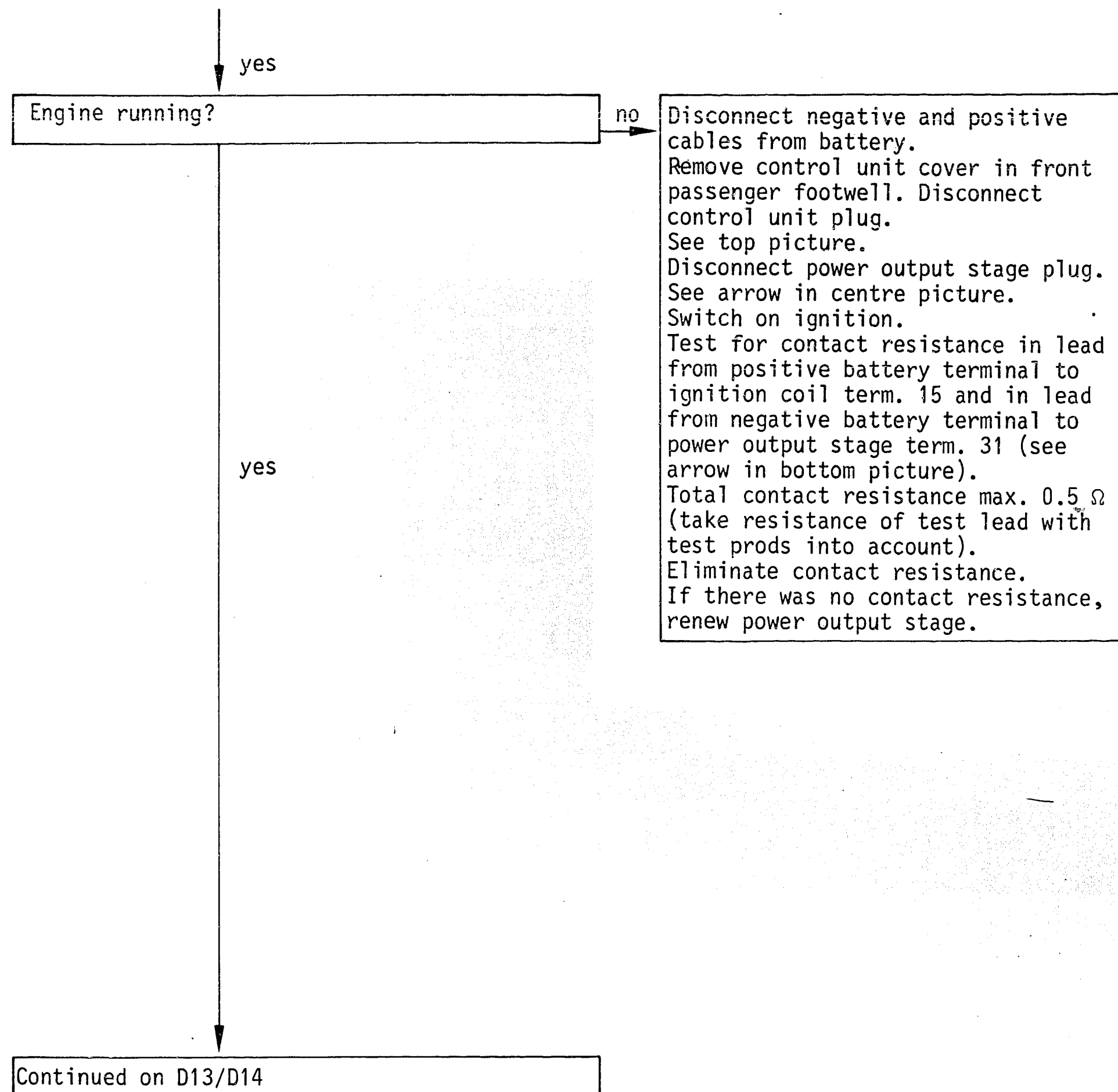


**D10**

Trouble-shooting program

Audi 200, as of 8.83





**D11**

Trouble-shooting program  
Audi 200, as of 8.83



**D12**

Trouble-shooting program  
Audi 200, as of 8.83



yes

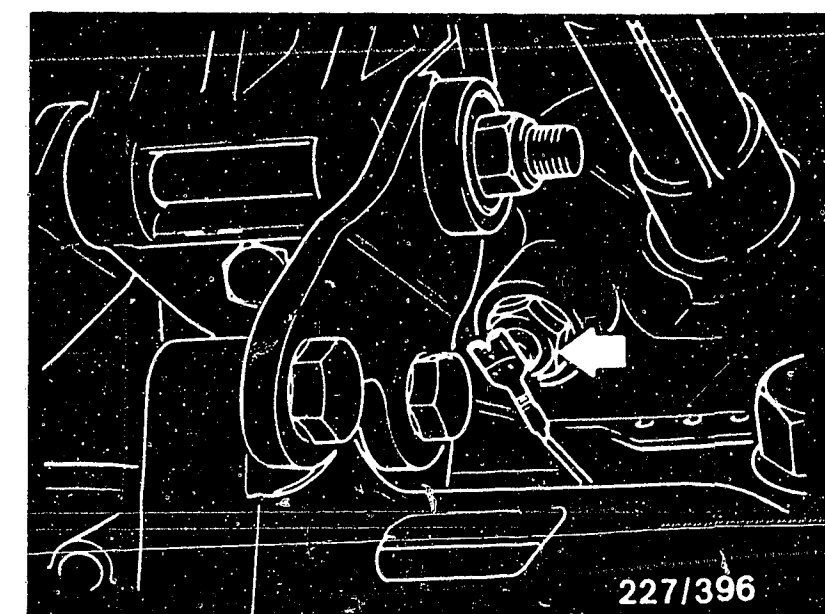
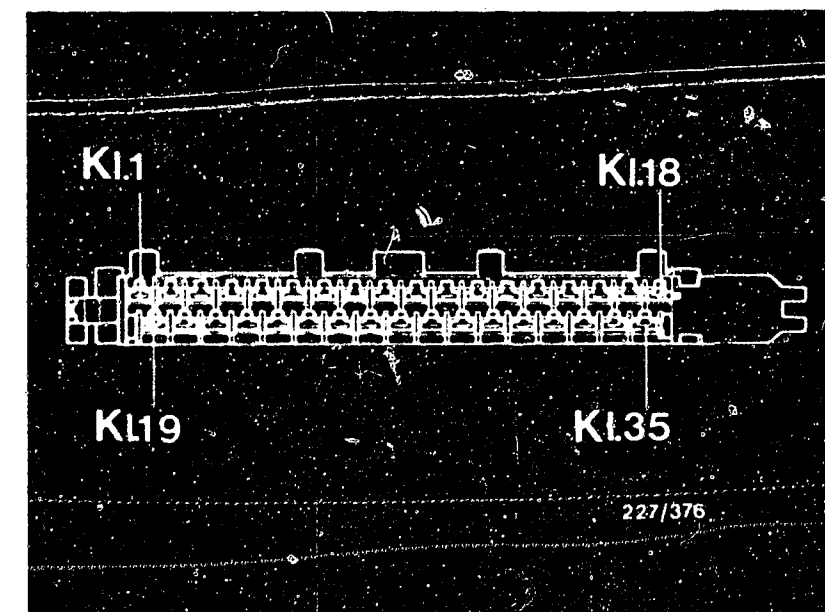
Test coolant-temperature sensor.  
Remove control unit cover in front passenger footwell. Disconnect control unit plug. See top picture.  
Connect ohmmeter with test prods to disconnected control unit plug term. 10 and term. 18.  
Ohmmeter must indicate the following readings at the following coolant temperatures:  
+15 ...+30° C = 600...1500  $\Omega$   
and at +80° C = 100... 140  $\Omega$   
Resistance value O.K.?

no

Test for open circuit in lead from control unit plug term. 10 to coolant-temperature sensor (see arrow in bottom picture).  
Eliminate open circuit.  
If there was no open circuit, renew coolant-temperature sensor.

yes

Continued on D15/D16



**D 13**

Trouble-shooting program  
Audi 200, as of 8.83



**D 14**

Trouble-shooting program  
Audi 200, as of 8.83



yes

Test intake-air temperature sensor.

Remove control unit cover in front passenger footwell. Disconnect control unit plug. See top picture. Connect ohmmeter with test prods to disconnected control unit plug term. 23 and term. 24. The ohmmeter must indicate 400...700  $\Omega$ . Resistance value O.K.?

no

1. If resistance  $\infty \Omega$

Push back protective cap on intake-air temperature sensor. See arrow in centre and bottom pictures. Connect ohmmeter to intake-air temperature sensor. See arrows in centre picture. If set value of 400...700  $\Omega$  not reached, renew intake-air temperature sensor. If set value reached, eliminate open circuit between intake-air temperature sensor (see arrow in centre picture for connection) and control unit plug term. 23 and term. 24.

2. If resistance approx. 0  $\Omega$ :

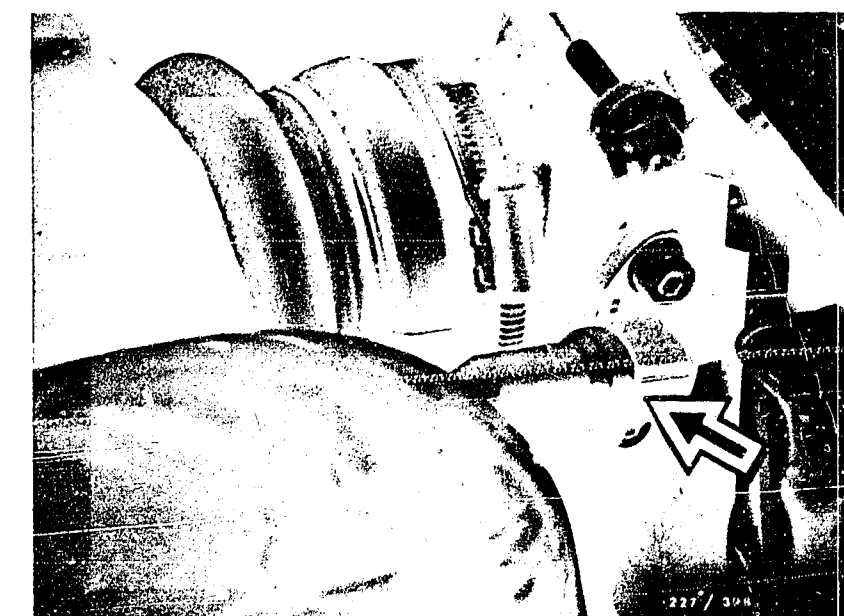
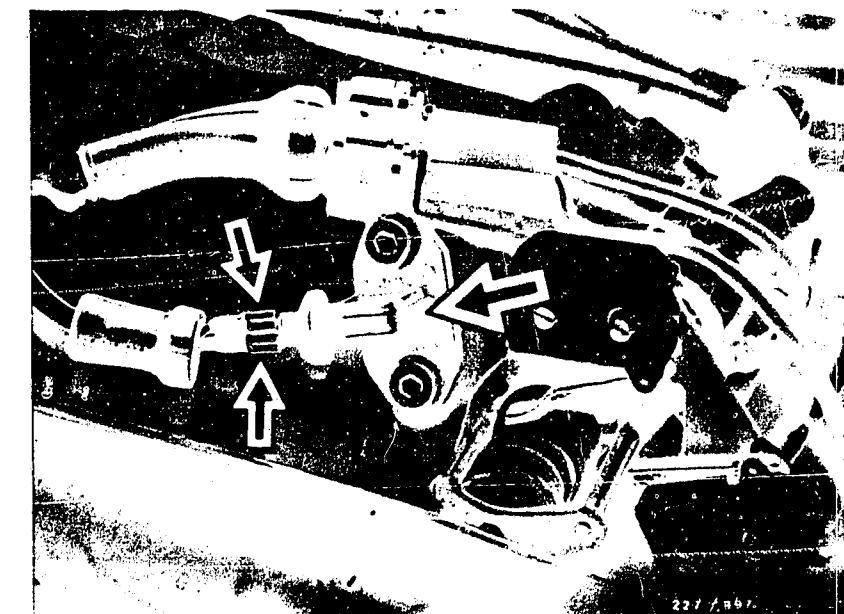
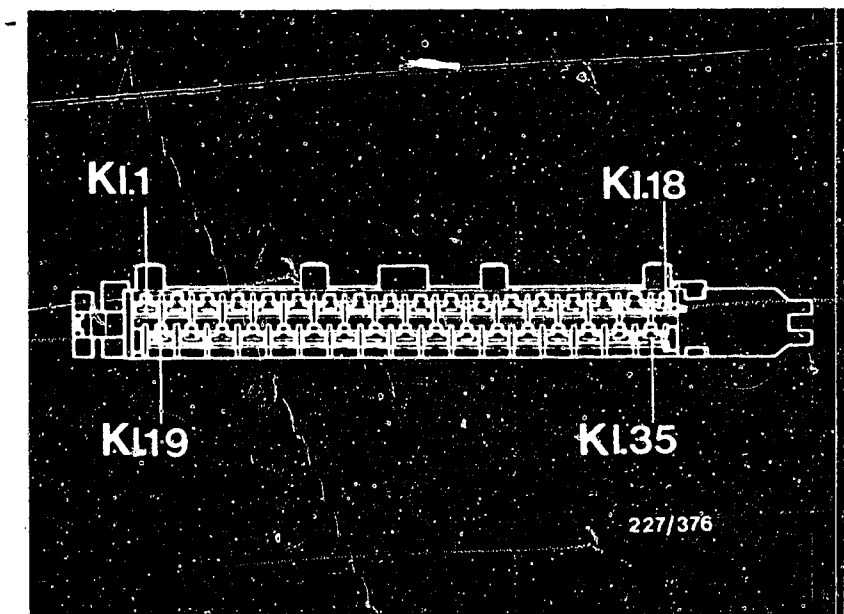
Eliminate short circuit to ground between intake-air temperature sensor lead (see arrow in centre picture for connection) and control unit plug term. 23 and term. 24.

3. If resistance different from set value 400...700  $\Omega$ :

Renew intake-air temperature sensor.

yes

Continued on D17/D18



**D15**

Trouble-shooting program

Audi 200, as of 8.83

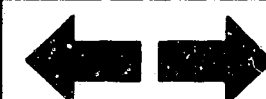
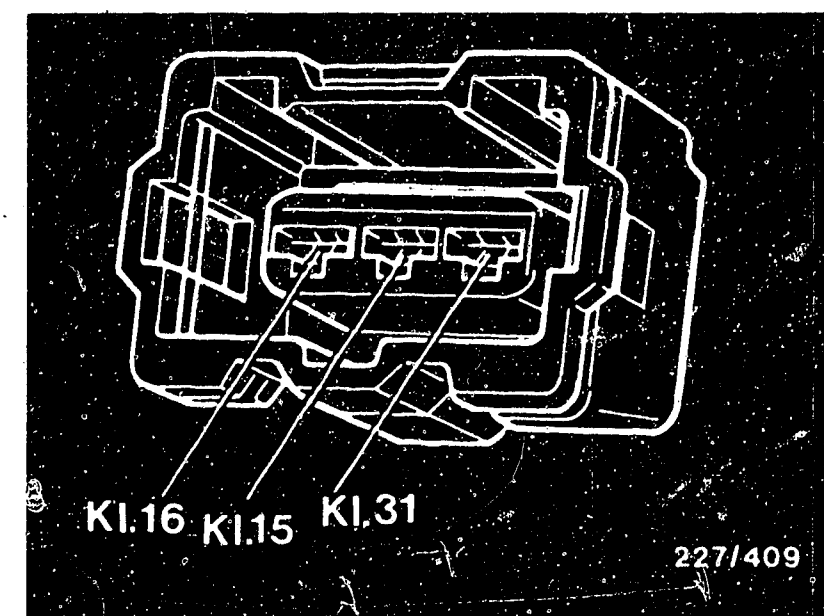
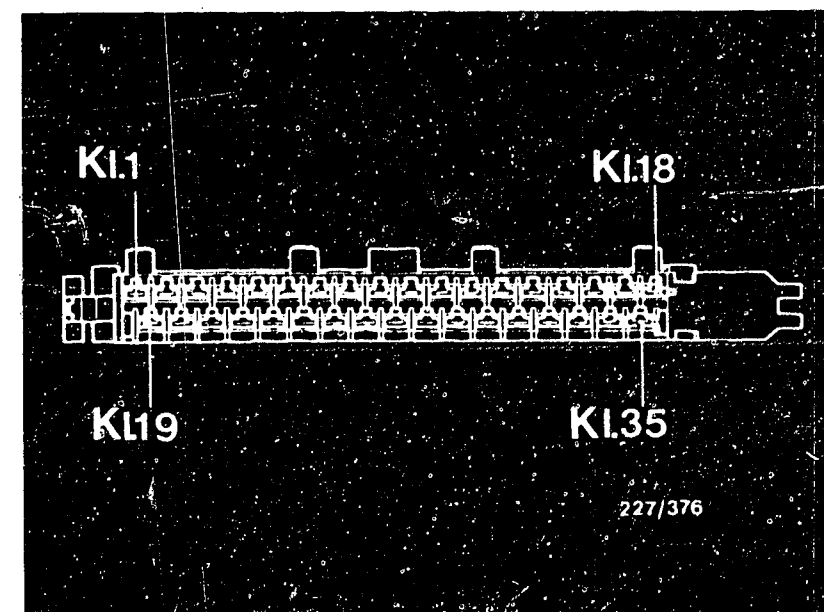
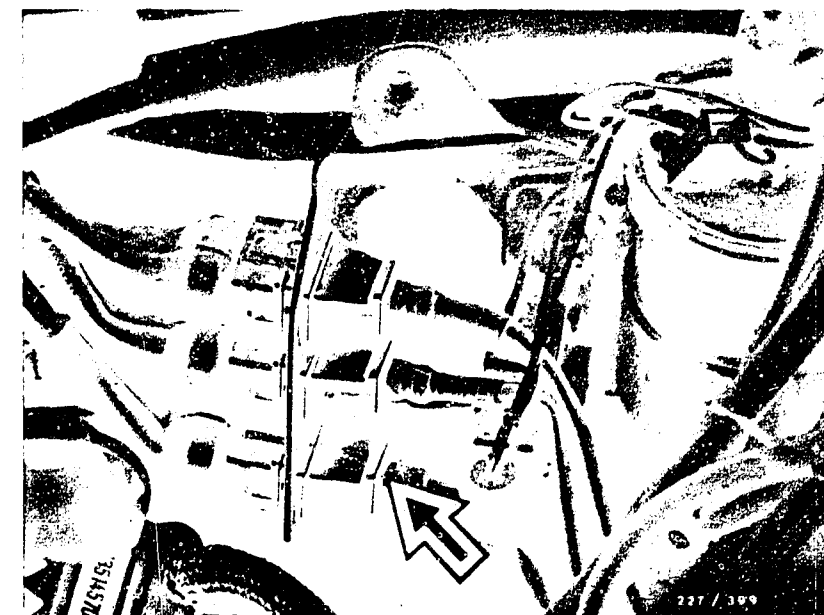
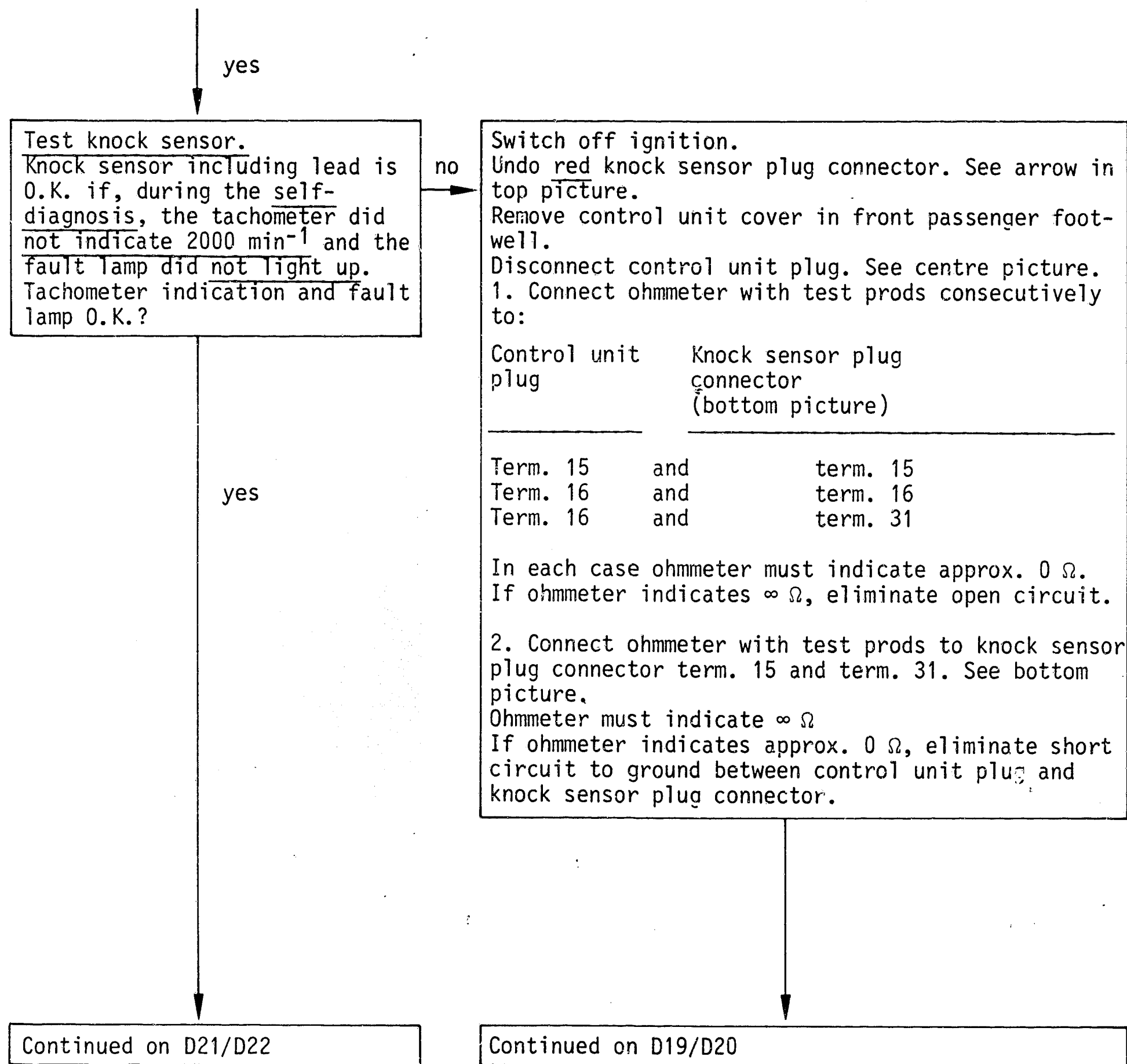


**D16**

Trouble-shooting program

Audi 200, as of 8.83







Continued

3. Check mounting of knock sensor  
(must not be loose).

If 1. to 3. O.K., renew knock sensor.



Arrow = Knock sensor

yes

Continued on D21/D22

**D 19**

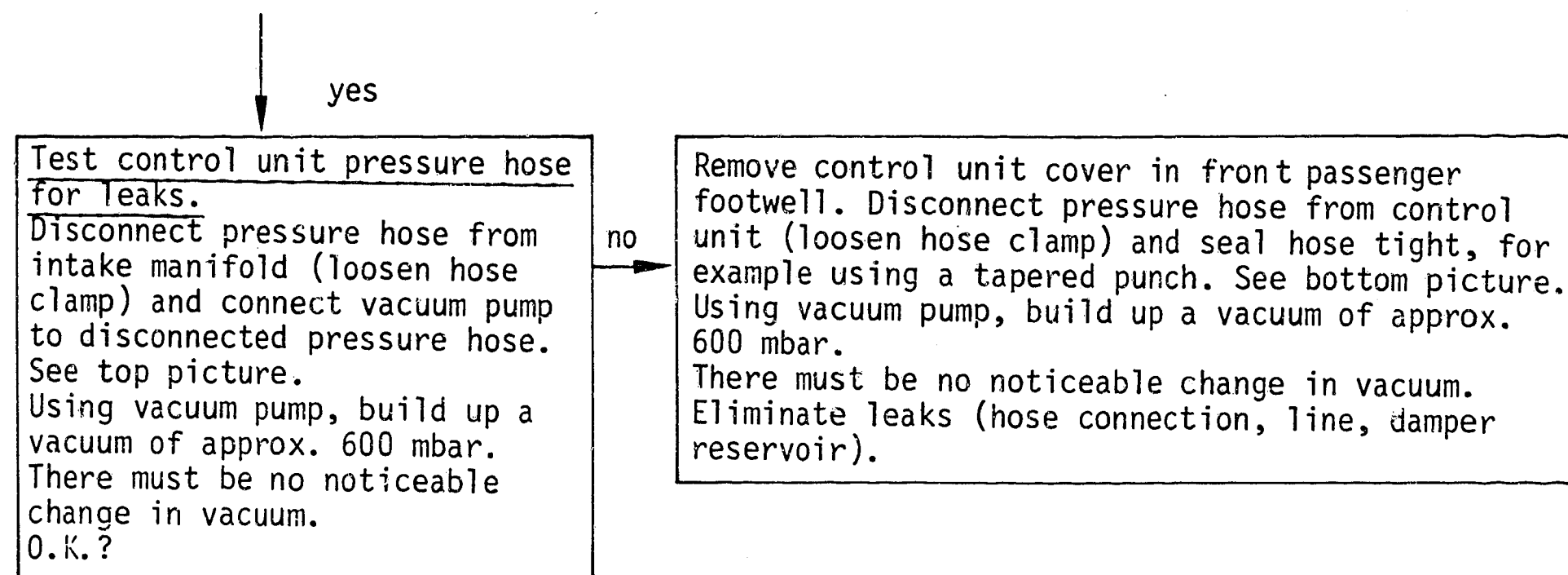
Trouble-shooting program  
Audi 200, as of 8.83



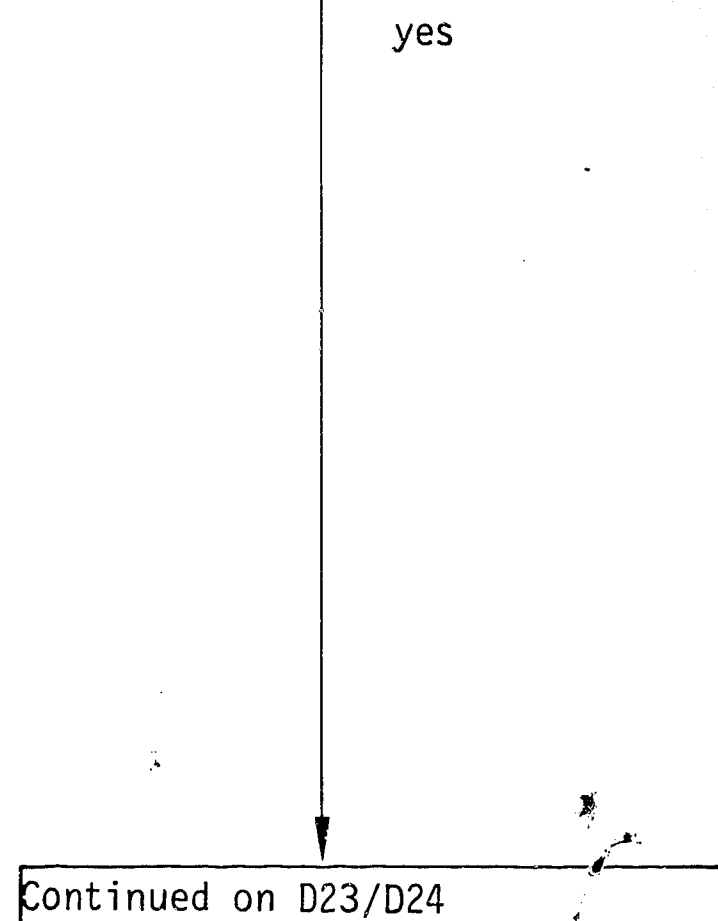
**D 20**

Trouble-shooting program  
Audi 200, as of 8.83

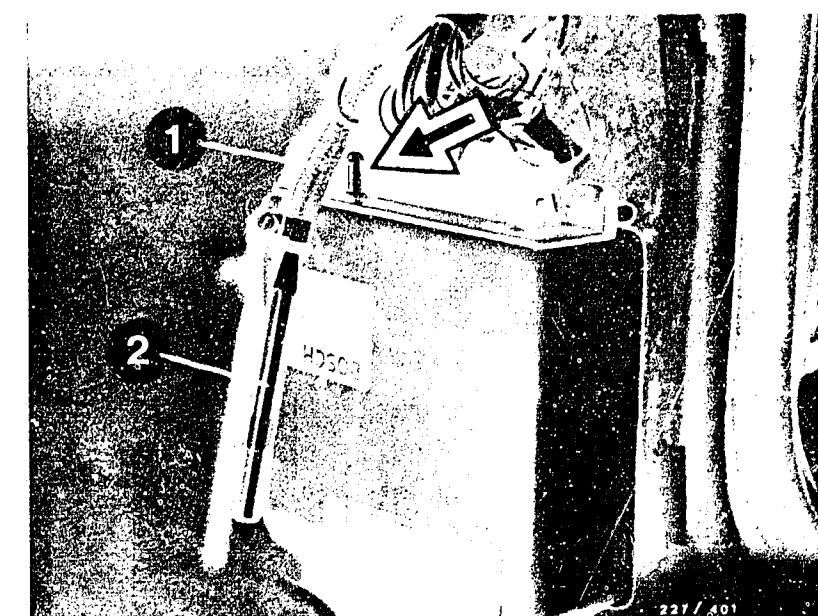




1 = Pressure hose  
2 = Vacuum pump



1 = Pressure hose  
2 = Tapered punch .





yes

### Test operation of pressure sensor.

Control unit plug and control unit pressure hose connected.

Disconnect pressure hose from intake manifold (loosen hose clamp) and connect vacuum pump to disconnected vacuum hose. See top picture. Connect motortester (engine speed, ignition timing test) according to operating instructions.

Operate engine at 2000...2500 min<sup>-1</sup>.

Set manual adjustment (delay) of timing light so that TDC is indicated. See arrow in bottom picture. Using vacuum pump, build up a vacuum of approx. 500 mbar.

The engine speed changes and the timing mark (TDC) must move.

Timing mark moved?

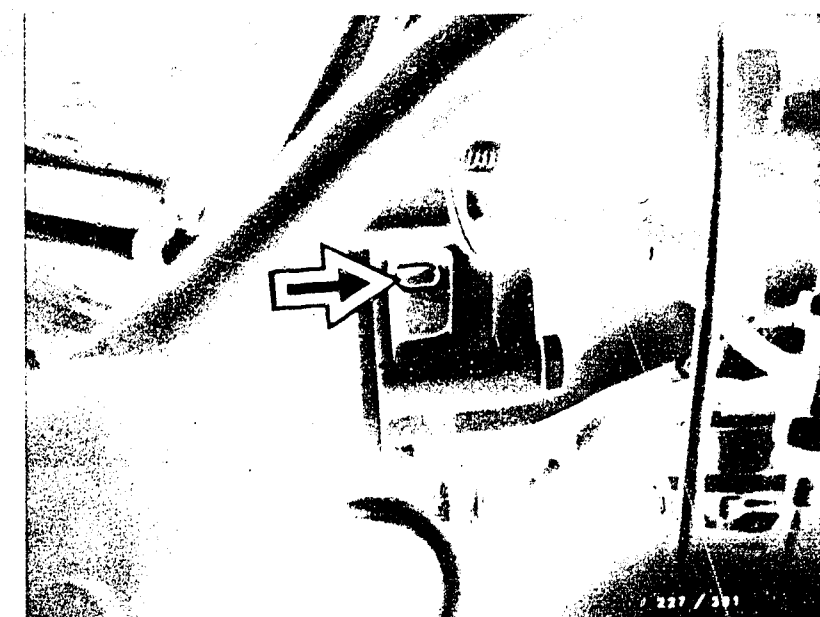
Renew control unit.

yes

Continued on E1/E2



1 = Pressure hose  
2 = Vacuum pump



**D23**

Trouble-shooting program

Audi 200, as of 8.83



**D24**

Trouble-shooting program

Audi 200, as of 8.83



yes

Test spark advance angle.

Bosch and Hitachi control unit

(Europe version excluding Sweden, Switzerland).

Operate engine at idle at 800...850 min<sup>-1</sup>.

Idle switch closed.

The spark advance angle must be 12...18° BTDC.

Hitachi control unit

(Sweden, Switzerland version)

Coolant temperature approx. 80° C.

Operate engine at 800...1500 min<sup>-1</sup>.

Idle switch closed.

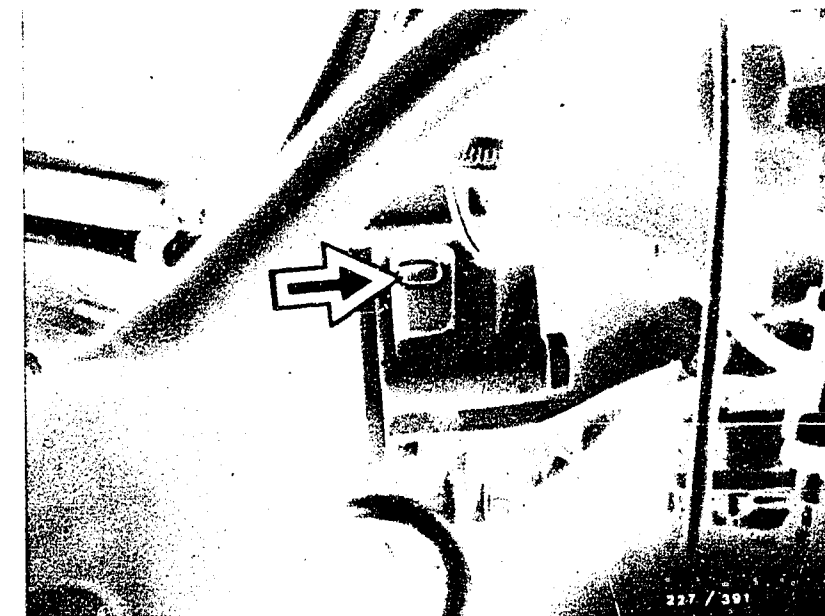
The spark advance angle must be 4...8° BTDC.

Spark advance angle O.K.?

Renew control unit.

yes

Continued on E3/E4



Arrow = TDC mark

**E1**

Trouble-shooting program

Audi 200, as of 8.83



**E2**

Trouble-shooting program

Audi 200, as of 8.83



yes

Test actuation of overrun-cutoff valve.

ONLY FOR VEHICLE WITH MANUALLY-SHIFTED TRANSMISSION

Control unit plug connected.  
Bring engine to normal operating temperature (coolant temperature greater than 50° C).  
Remove cover for idle and full-load switches.  
Operate engine at 2000...2500 min<sup>-1</sup>. Close idle switch (2) by hand.  
See arrow in top picture.  
Engine speed drops immediately (engine hunts).  
Engine speed dropped?

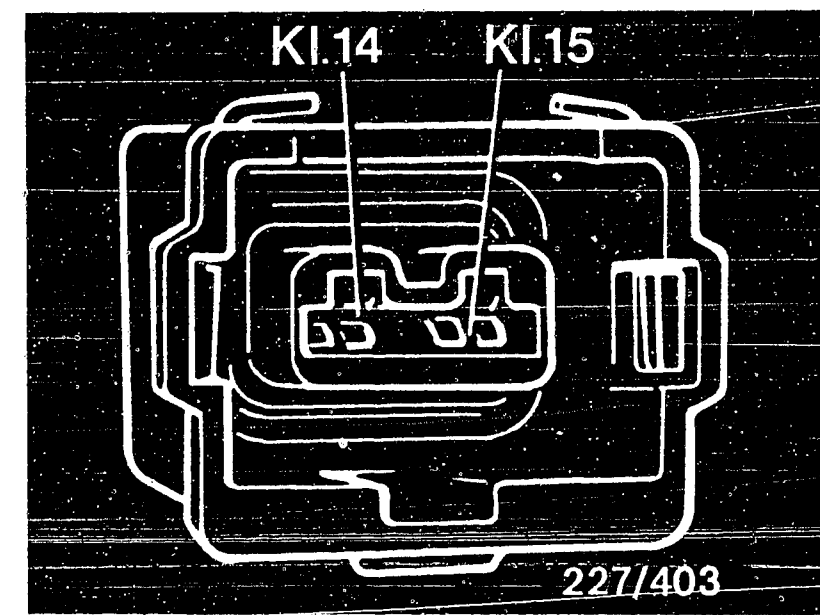
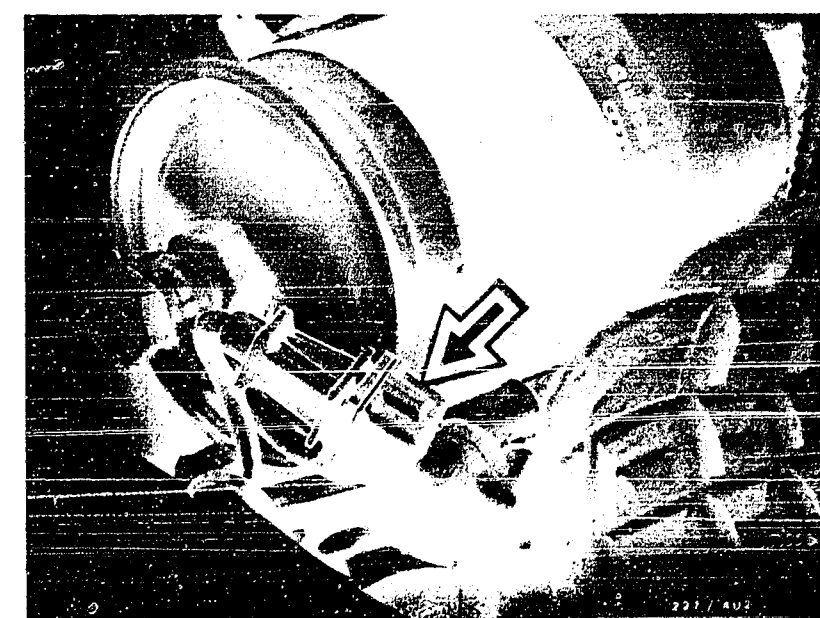
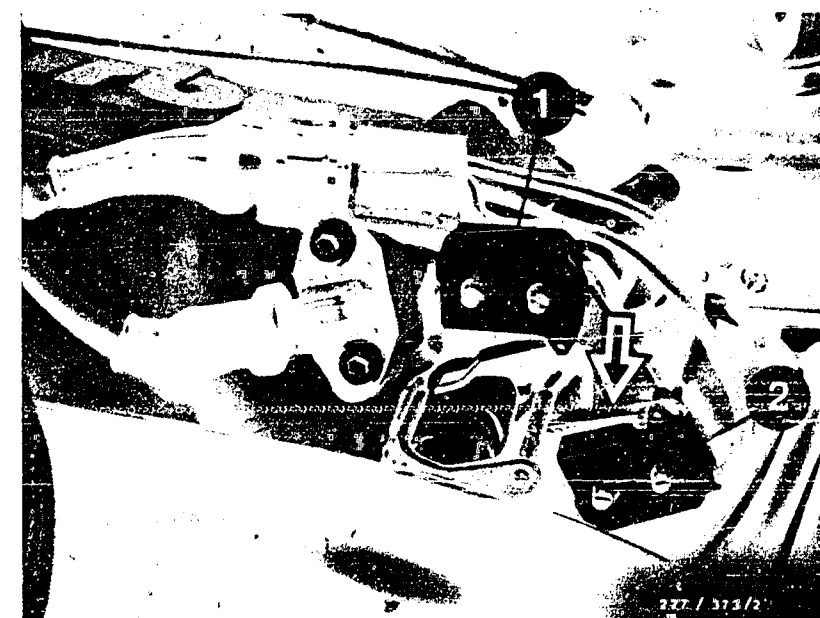
no

1. Undo overrun-cutoff valve plug connector. See arrow in centre picture.  
Connect voltmeter with test prods to overrun-cutoff valve connector term. 15 (+) and term. 14 (-). See bottom picture.  
Operate engine at at least 2000 min<sup>-1</sup>.  
Suddenly close throttle valve.  
Voltmeter must briefly indicate approx. battery voltage.  
If battery voltage not indicated, eliminate open circuit between ignition/starting switch term. 15 and overrun-cutoff valve connector term. 15 or between overrun-cutoff valve connector term. 14 and control unit plug term. 14.  
If there was no open circuit, renew control unit.

yes

Continued on E7/E8

Continued on E5/E6



E3

Trouble-shooting program  
Audi 200, as of 8.83



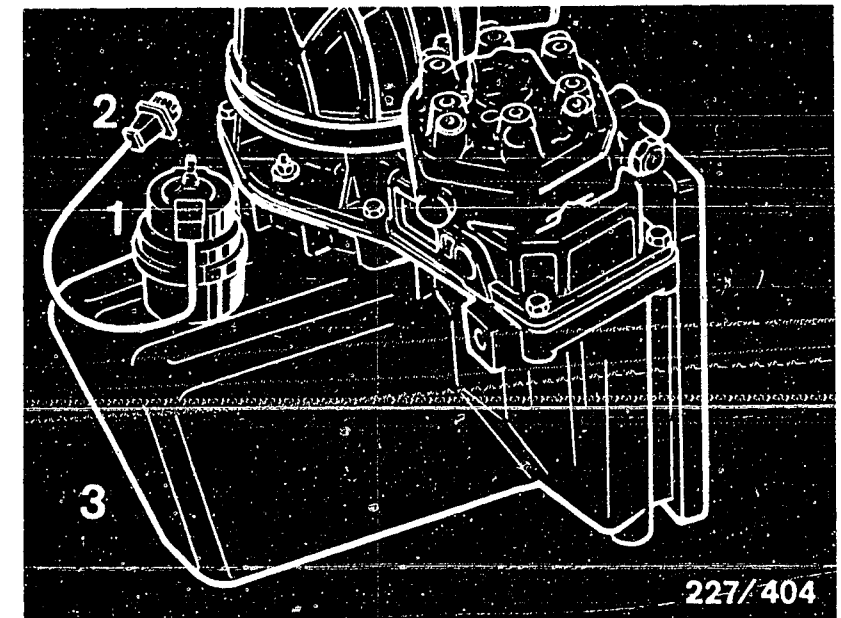
E4

Trouble-shooting program  
Audi 200, as of 8.83



Continued

If 1. O.K., remove overrun-cutoff valve, check it for proper operation and, if necessary, renew. See picture.



- 1 = Overrun-cutoff valve
- 2 = Plug connector
- 3 = Air filter housing

yes

Continued on E7/E8

**E5**

Trouble-shooting program  
Audi 200, as of 8.83



**E6**

Trouble-shooting program  
Audi 200, as of 8.83



yes

Test actuation of two-way valve.  
Bring engine to normal operating temperature (coolant temperature approx. +80° C).  
Remove cover for idle and full-load switches.  
Operate engine at idle.  
Repeatedly actuate full-load switch (1) by hand as far as it will go.  
See arrow in top picture.  
Two-way valve must switch (can be felt by hand).  
See arrow in centre picture.  
Two-way valve switched?

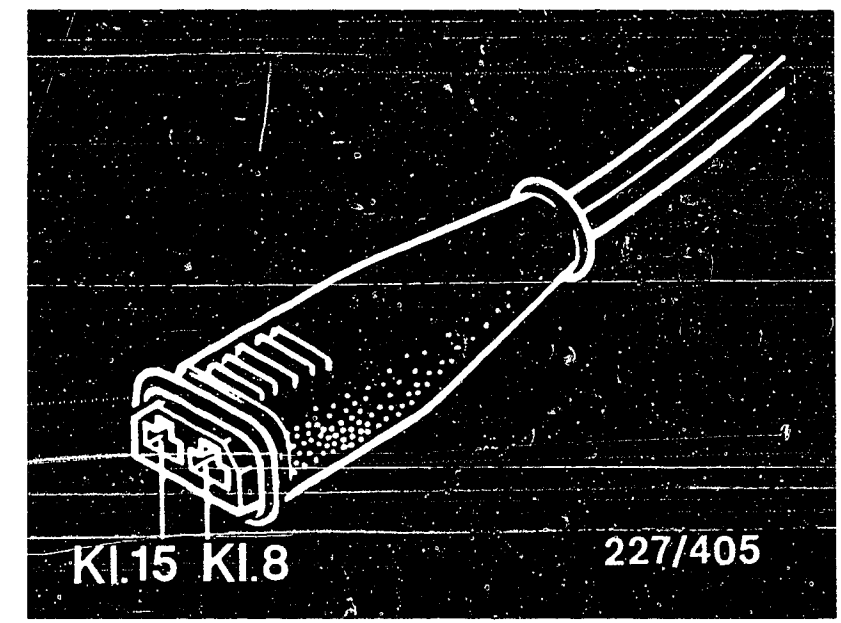
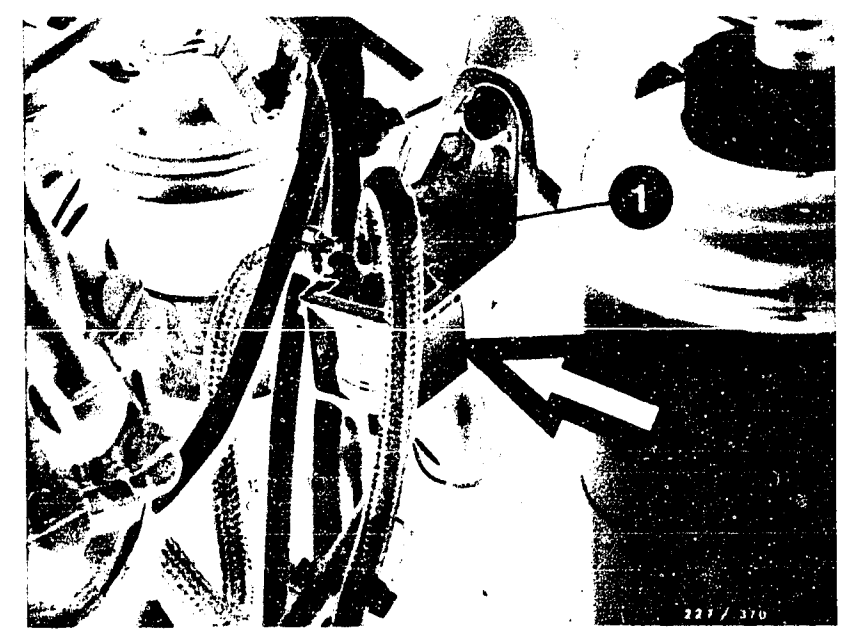
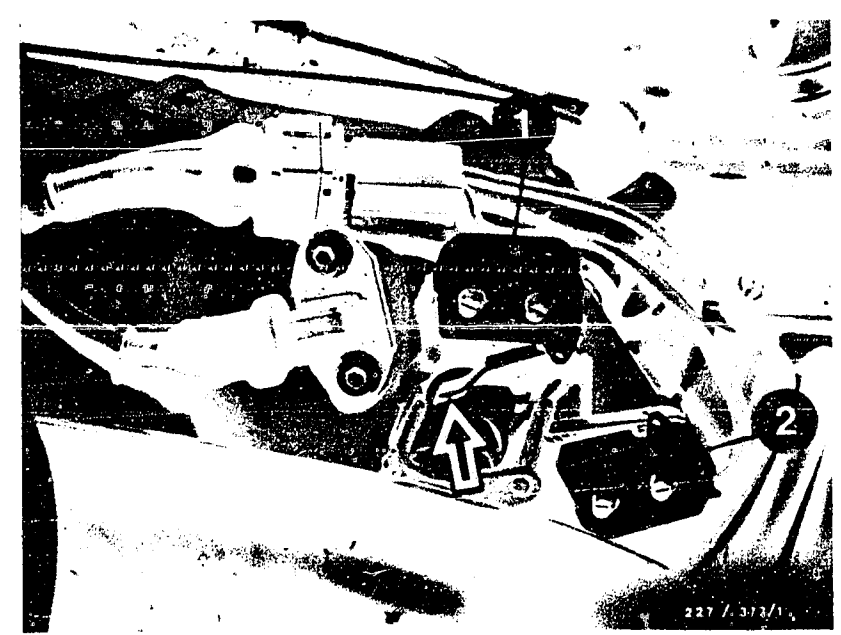
no

1. Disconnect plug from two-way valve (1) (arrow in centre picture).  
Connect voltmeter with test prods to two-way valve connector term. 15 (+) and term. 8 (-).  
See bottom picture.  
Operate engine at idle.  
Voltmeter indicates approx. battery voltage.  
Actuate full-load switch by hand as far as it will go.  
Voltmeter must now indicate 0 V.

yes

Continued on E11/E12

Continued on E9/E10

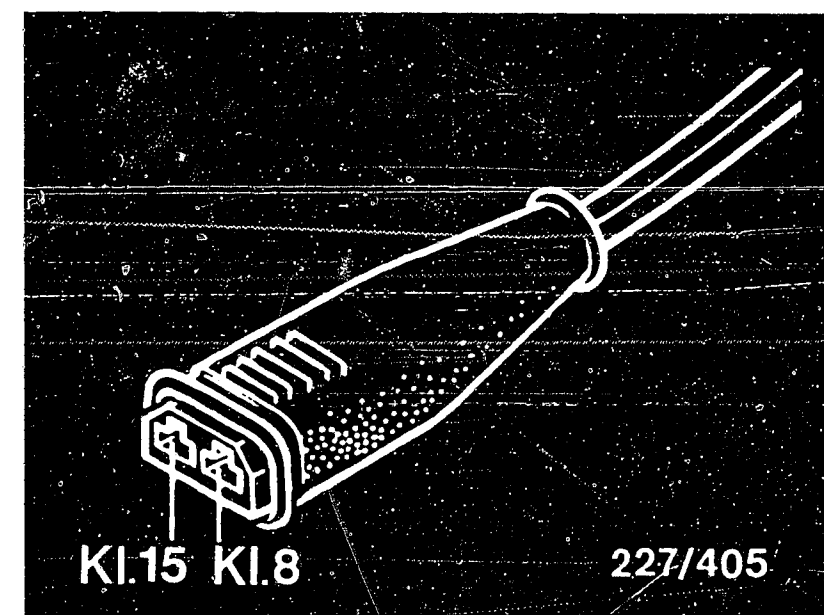


Continued

2. If battery voltage not indicated, test for open circuit in lead from ignition/starting switch term. 15 to two-way valve connector term. 15 and from two-way valve connector term. 8 to control unit plug term. 8. Eliminate open circuit. If there was no open circuit, renew control unit. If 1. O.K., remove two-way valve, check for proper operation and, if necessary, renew.

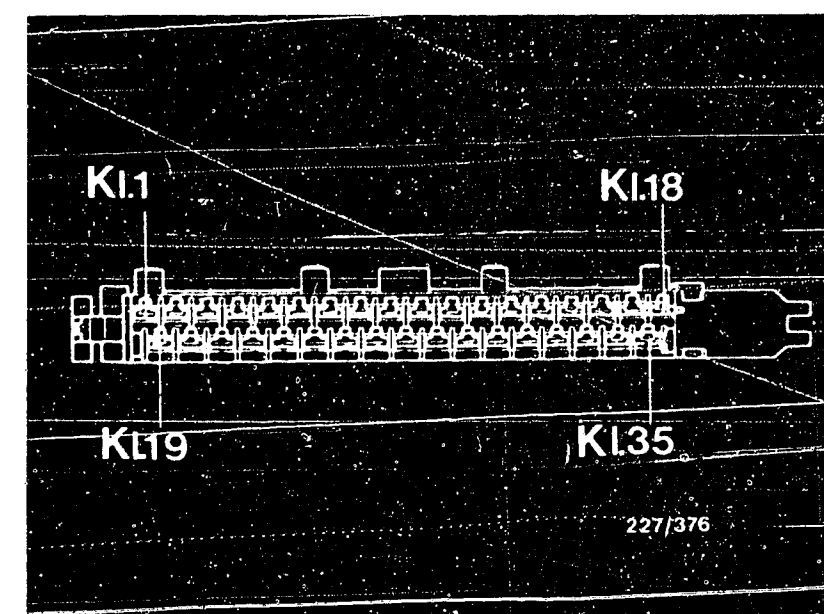
yes

Continued on E11/E12



Two-way valve connector

Control unit plug



**E9**

Trouble-shooting program  
Audi 200, as of 8.83



**E10**

Trouble-shooting program  
Audi 200, as of 8.83





yes

Test actuation of vacuum-control valve for exhaust-gas recirculation.

ONLY FOR VEHICLE WITH ENGINE CODE LETTER JY.

Bring engine to normal operating temperature (coolant temperature approx. 80° C).

Undo vacuum-control valve plug connector (1). See arrow in top picture.

Remove cover of idle and full-load switches.

Undo plug connector of idle and full-load switch. See arrow in centre picture.

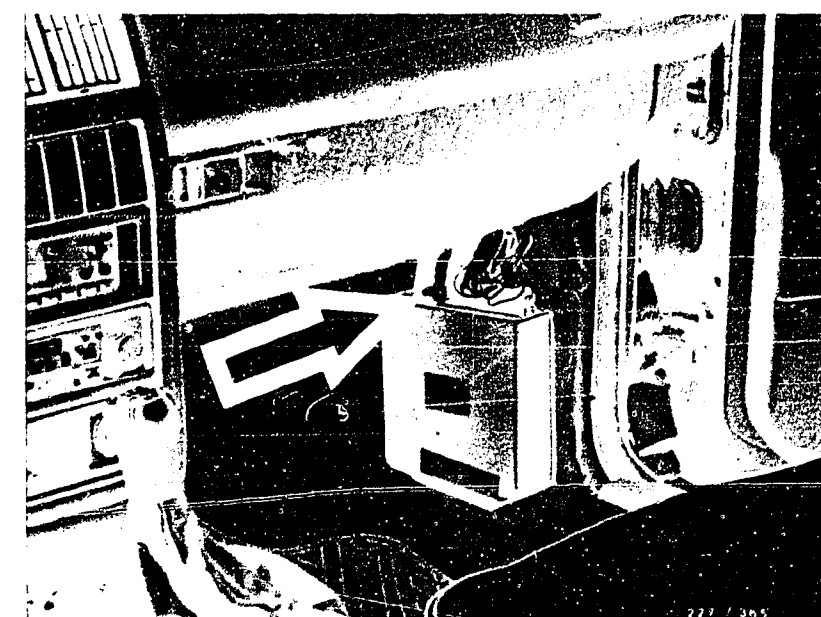
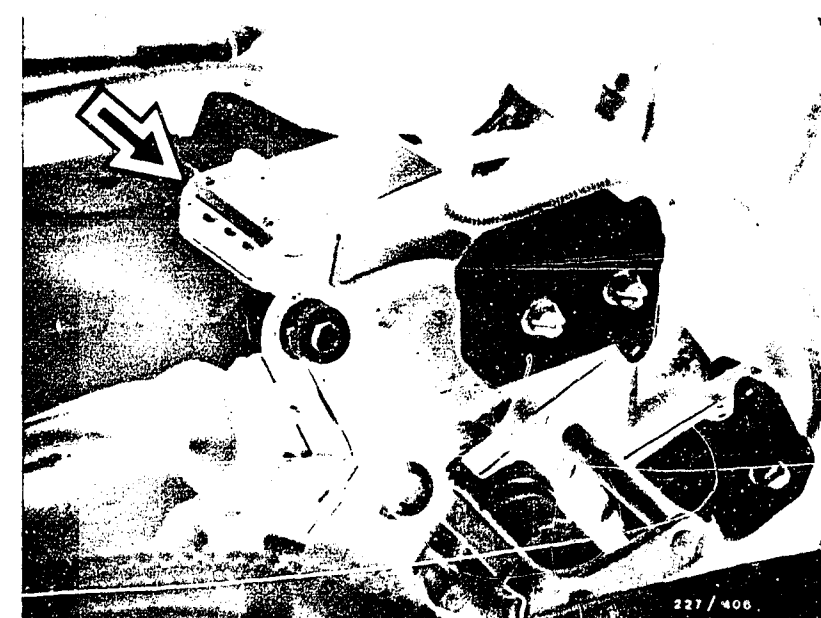
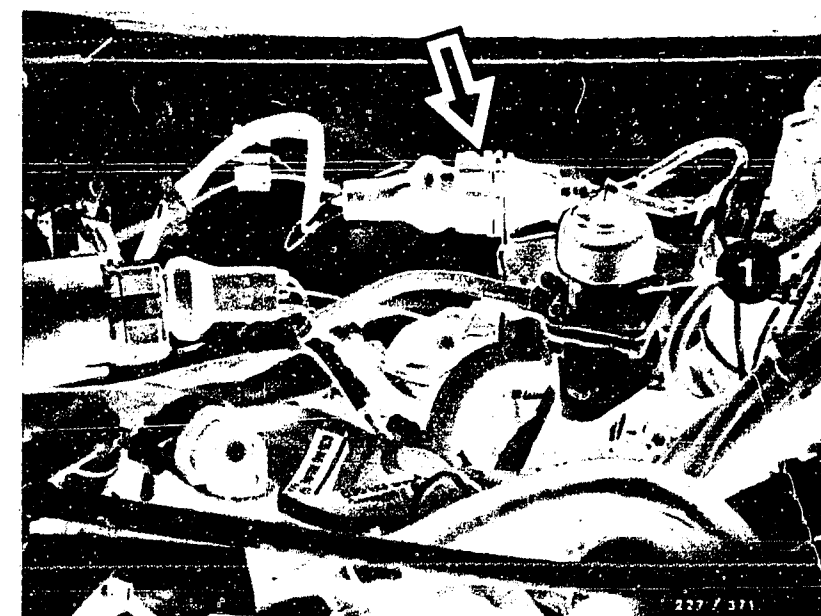
Remove control unit cover in front passenger footwell.

Disconnect control unit pressure hose (loosen hose clamp).

See bottom picture.

yes

Continued on E13/E14



**E11**

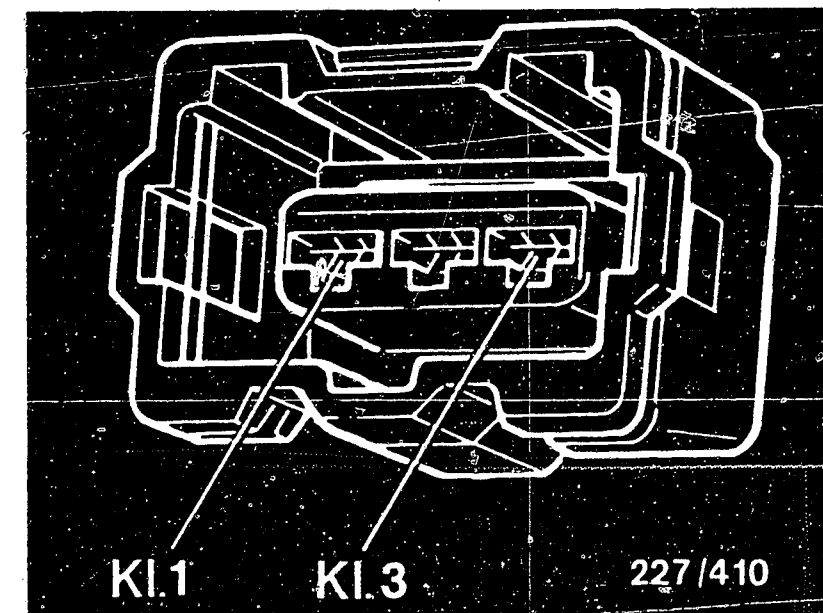
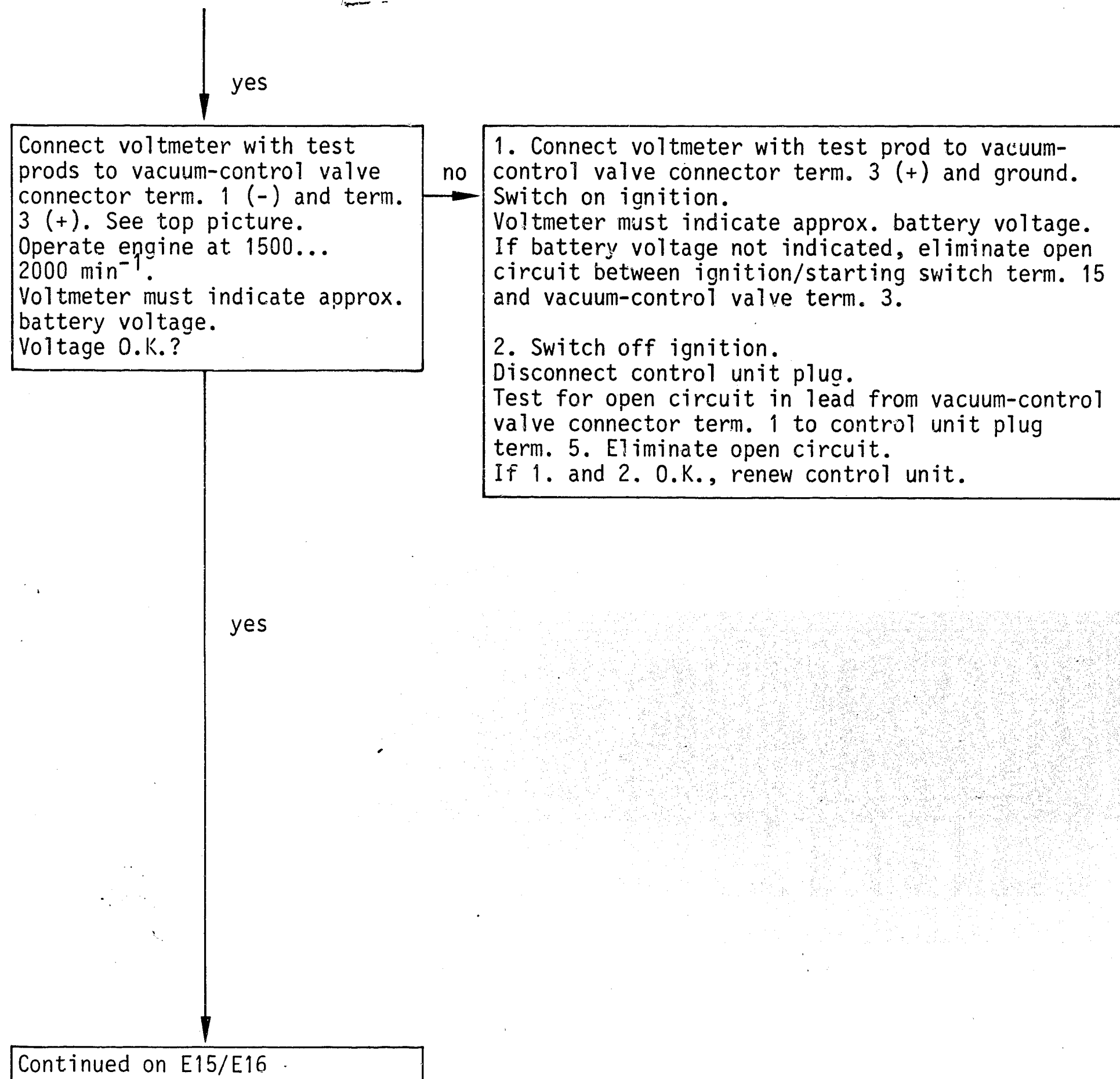
Trouble-shooting program  
Audi 200, as of 8.83



**E12**

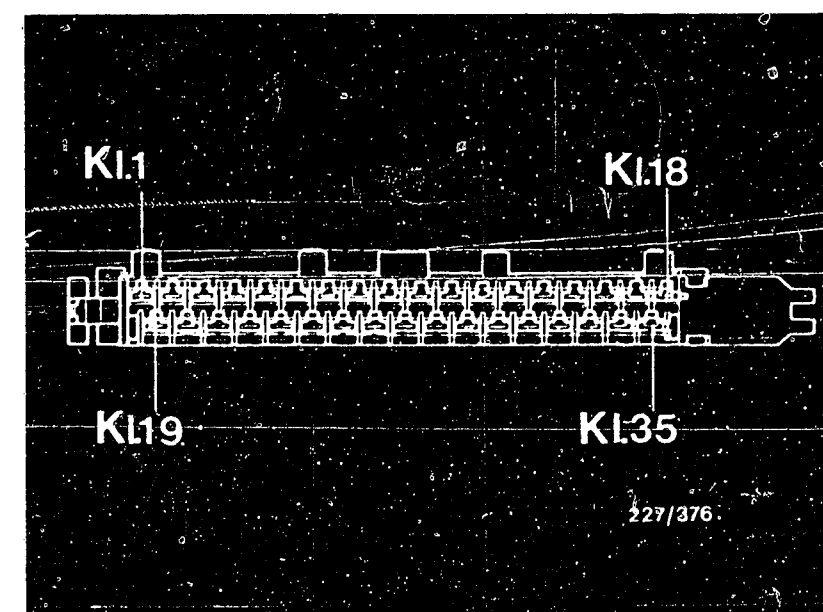
Trouble-shooting program  
Audi 200, as of 8.83





Vacuum-control valve connector

Control unit plug



**E13**

Trouble-shooting program  
Audi 200, as of 8.83



**E14**

Trouble-shooting program  
Audi 200, as of 8.83





yes

### Test control unit power supply.

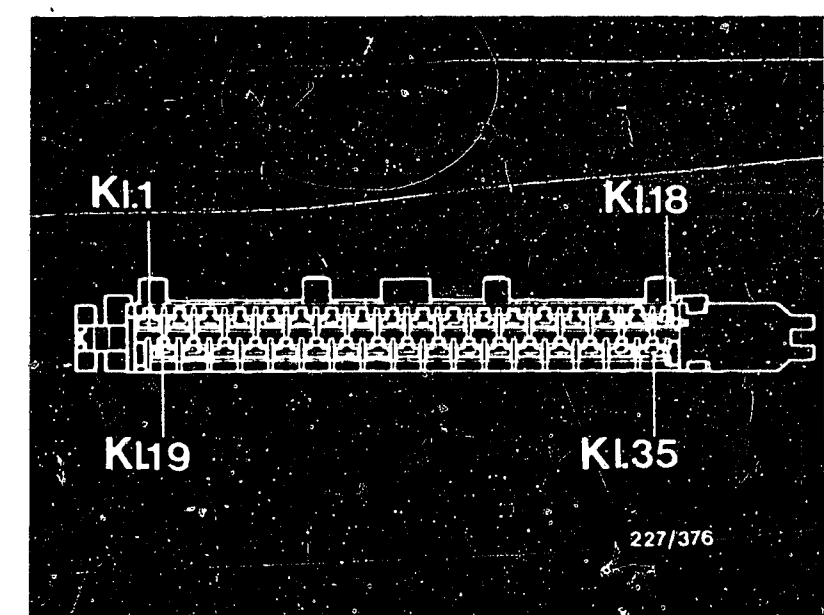
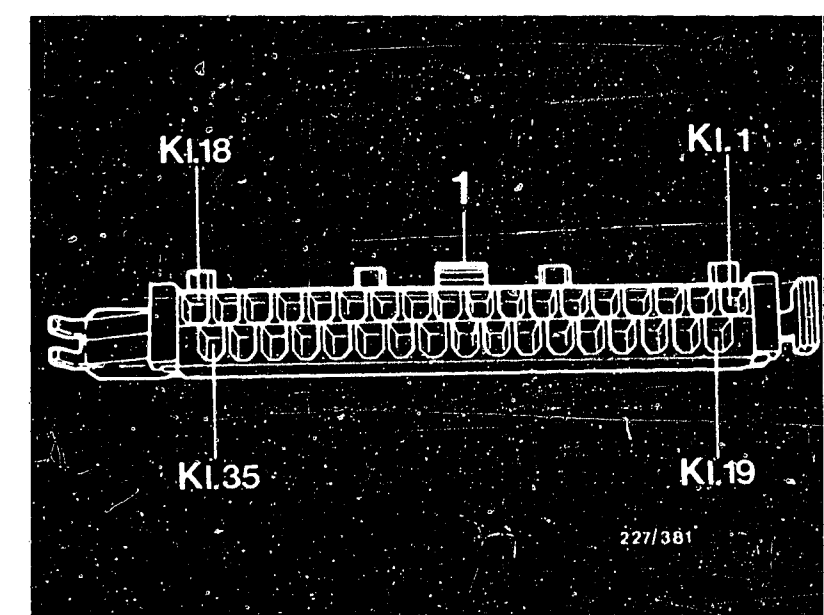
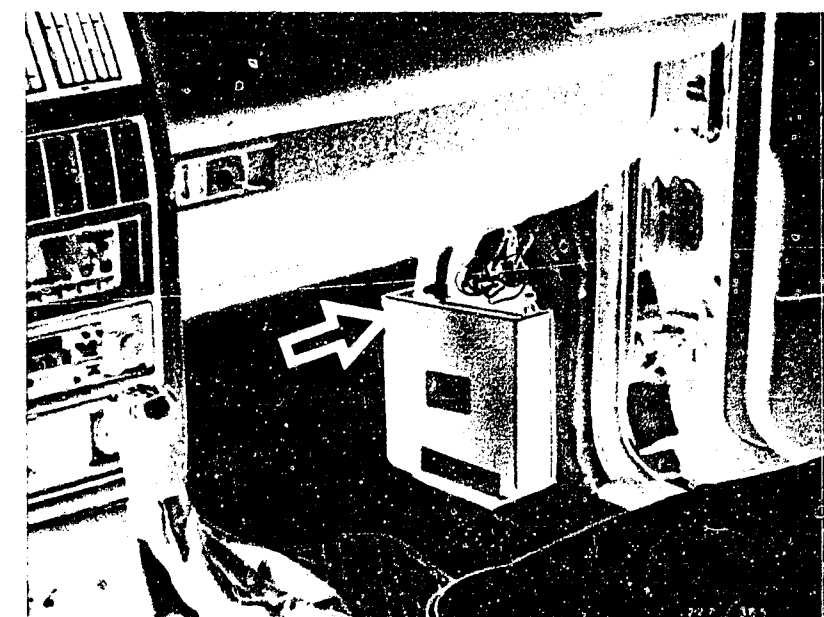
Remove control unit cover in front passenger footwell.  
Remove control unit.  
See top picture.  
Control unit plug connected.  
Connect voltmeter with test prods to control unit plug term. 35 (+) and term. 18 (-).  
See centre picture.  
Operate engine at idle.  
The measured voltage must be 12...14 V and must be no more than 2 V below battery voltage.  
Voltage O.K.?

no

Disconnect negative and positive cables from battery. Disconnect control unit plug.  
Switch on ignition.  
Test for contact resistance in leads between positive battery terminal and control unit plug term. 35 including leads from negative battery terminal to control unit plug term. 18.  
Total contact resistance max. 0.5  $\Omega$  (take resistance of test lead with test prods into account).  
Eliminate contact resistance.

yes

Continued on E17/E18



**E15**

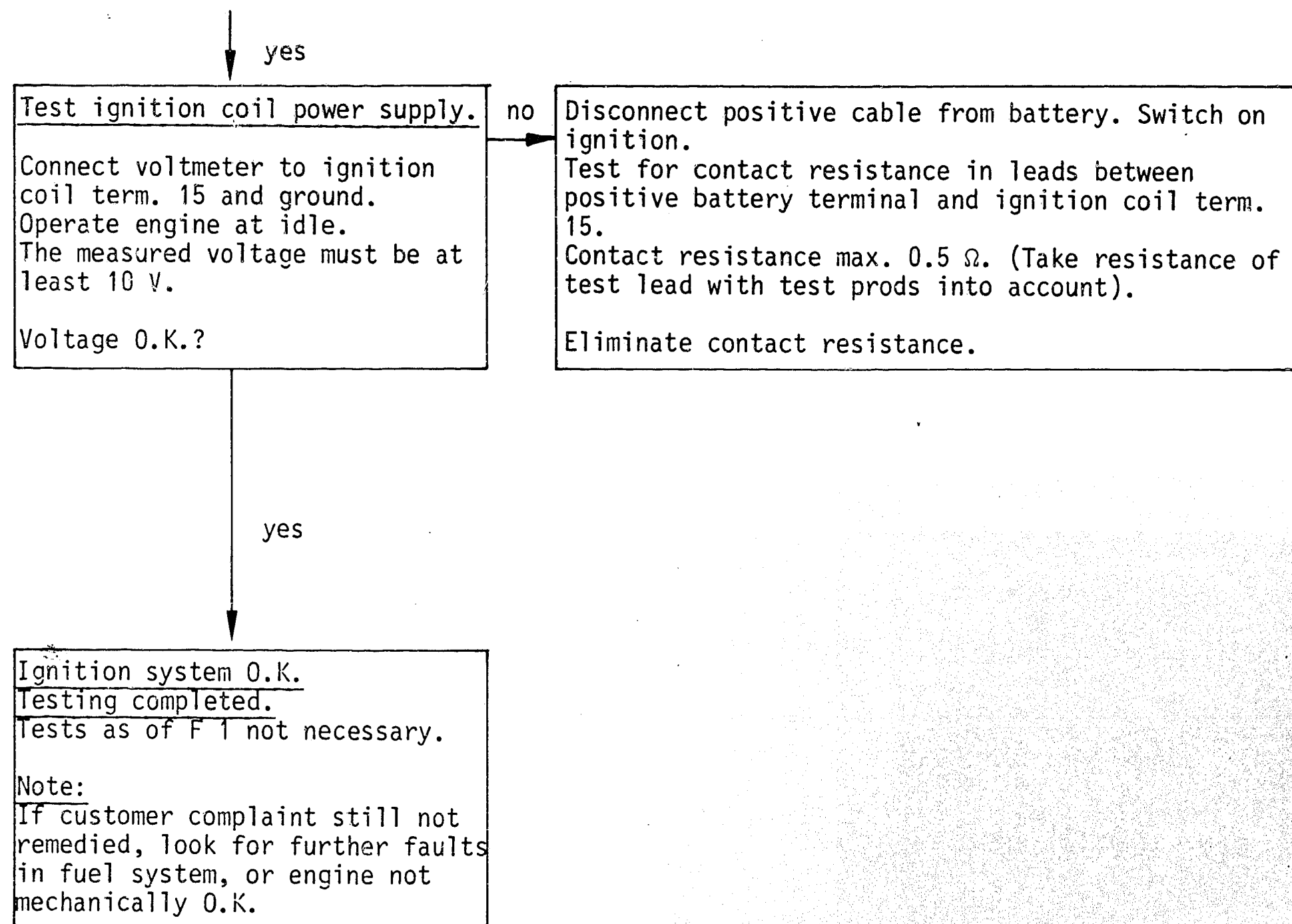
Trouble-shooting program  
Audi 200, as of 8.83



**E16**

Trouble-shooting program  
Audi 200, as of 8.83





No primary signal/no ignition spark

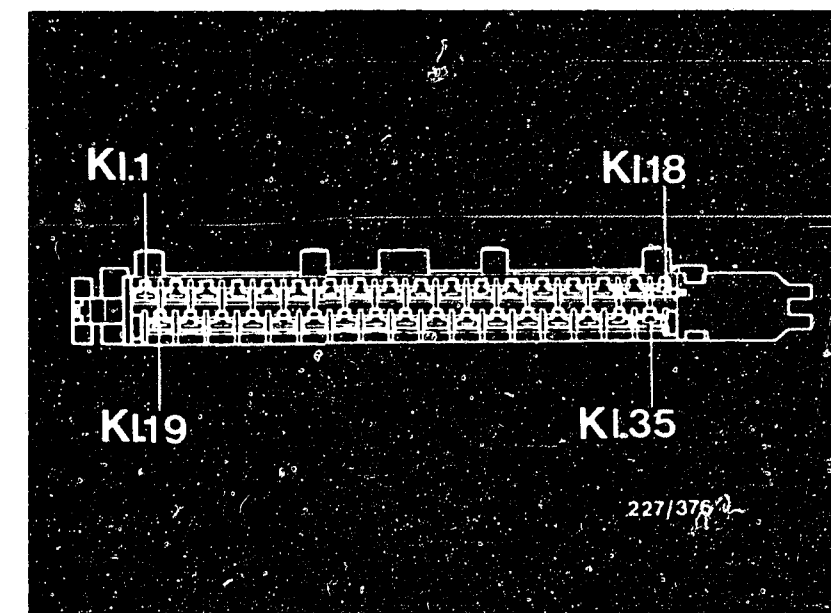
Continued from C7/C8

yes

Test control unit power supply.  
Remove control unit cover in front passenger footwell.  
Disconnect control unit plug.  
Connect voltmeter with test prods to control unit plug term. 35 (+) and term. 18 (-).  
See picture.  
Switch on ignition.  
Voltmeter must indicate battery voltage.  
Voltage O.K.?

no

Test for open circuit in leads and connections between ignition/starting switch and control unit plug term. 35 including ground lead term. 18.  
Eliminate open circuit.



Control unit plug

yes

Continued on F3/F4

**F1**

Trouble-shooting program  
Audi 200, as of 8.83



**F2**

Trouble-shooting program  
Audi 200, as of 8.83



yes

Test primary circuit.  
Disconnect power output stage plug. See arrow in top picture.  
Connect voltmeter to ignition coil term. 1 and ground. See pictures.  
Switch on ignition.  
The voltmeter must indicate battery voltage.

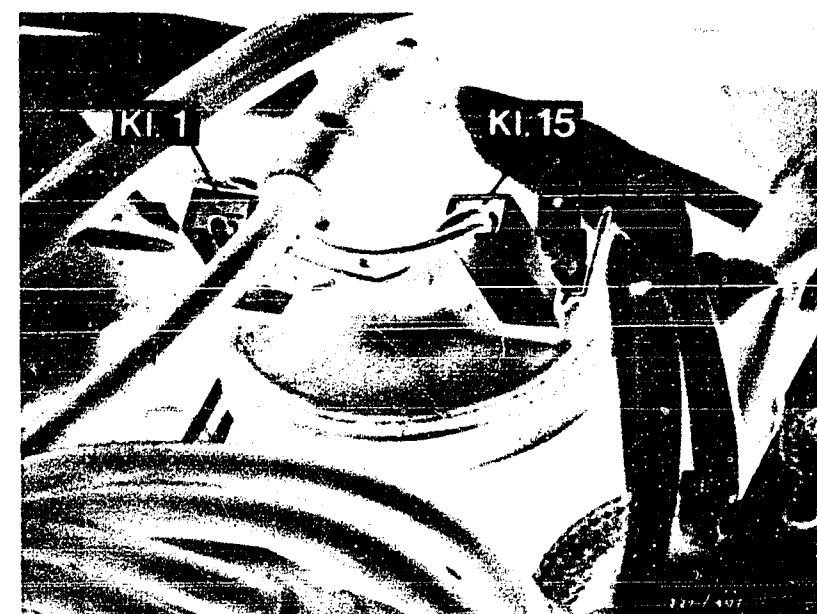
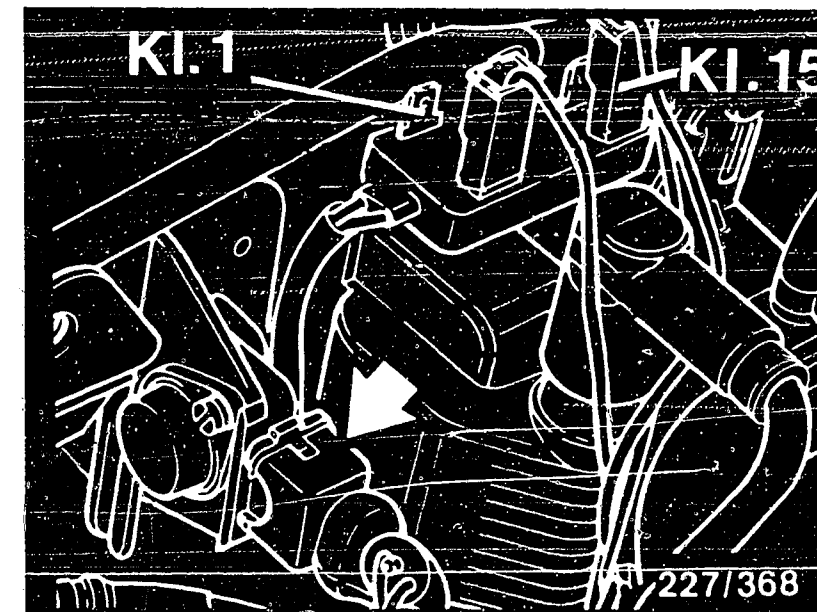
Voltage O.K.?

no

Test for open circuit in lead from ignition/starting switch to ignition coil term. 15 and in primary winding of ignition coil.  
Eliminate open circuit.

yes

Continued on F5/F6



**F3**

Trouble-shooting program  
Audi 200, as of 8.83



**F4**

Trouble-shooting program  
Audi 200, as of 8.83



yes

Test insulation of engine-speed sensor (2).

Control unit plug disconnected.  
Connect ohmmeter with test prods to disconnected control unit plug term. 28 and term. 29.  
See top picture.  
Ohmmeter must indicate infinity ( $\infty$ ).

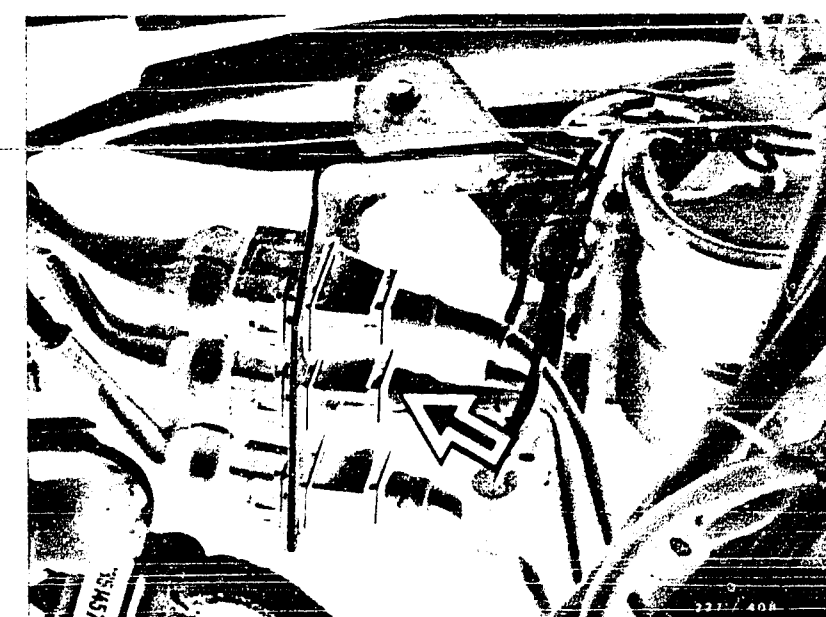
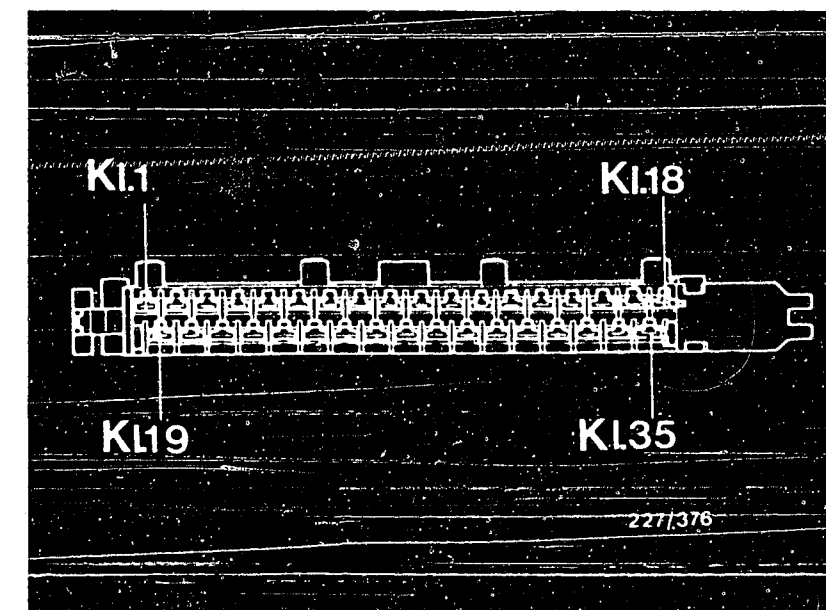
Resistance O.K.?

no

If resistance is approx.  $1\text{ k}\Omega$ , undo grey engine-speed sensor plug connector. See arrow in centre picture. If resistance is now  $\infty\Omega$ , renew engine-speed sensor. See arrow in bottom picture.  
If resistance is approx.  $0\Omega$ , renew 3-core shielded Tead between plug connector and control unit plug, or wiring harness.

yes

Continued on F7/F8



**F5**

Trouble-shooting program  
Audi 200, as of 8.83



**F6**

Trouble-shooting program  
Audi 200, as of 8.83



yes

Test internal resistance of engine-speed sensor.

Control unit plug disconnected.  
Connect ohmmeter with test prods to disconnected control unit plug term. 11 and term. 29.  
See top picture.  
Ohmmeter must indicate approx. 1 k $\Omega$ .  
Resistance O.K.?

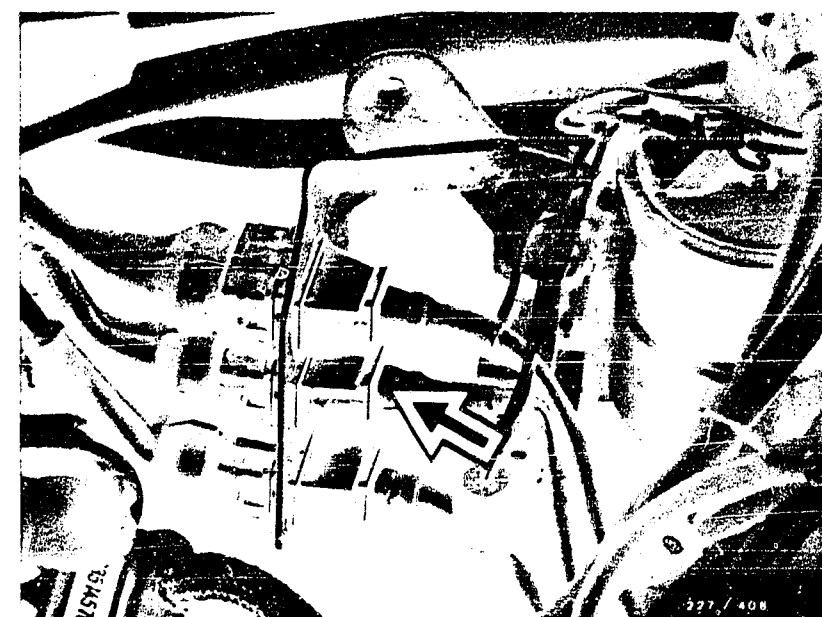
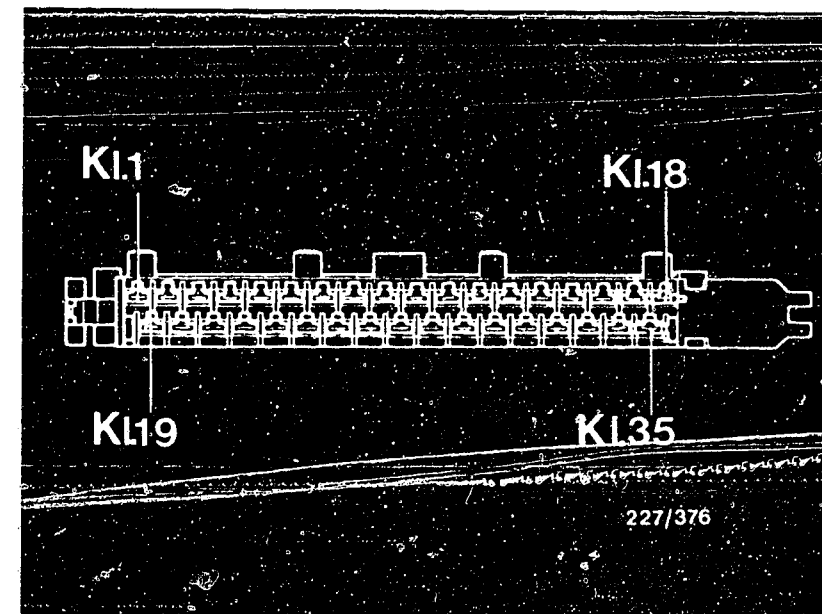
no

If ohmmeter indicates  $\infty \Omega$ , undo grey engine-speed sensor plug connector.  
See arrow in bottom picture.

yes

Continued on F11/F12

Continued on F9/F10



**F7**

Trouble-shooting program  
Audi 200, as of 8.83



**F8**

Trouble-shooting program  
Audi 200, as of 8.83





Continued

Connect ohmmeter consecutively to:

Control unit plug

Engine-speed sensor  
connector (grey)

Term. 11  
Term. 29

and  
and

term. 11  
term. 29

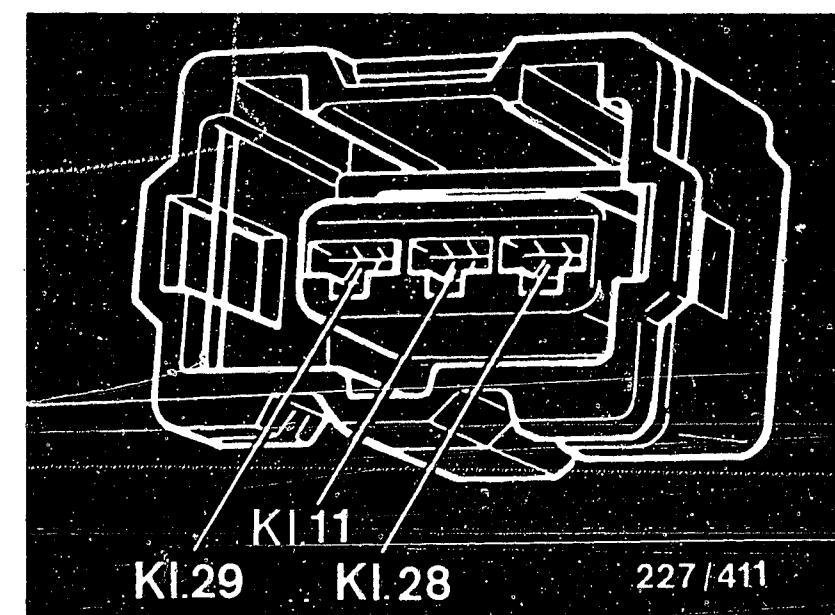
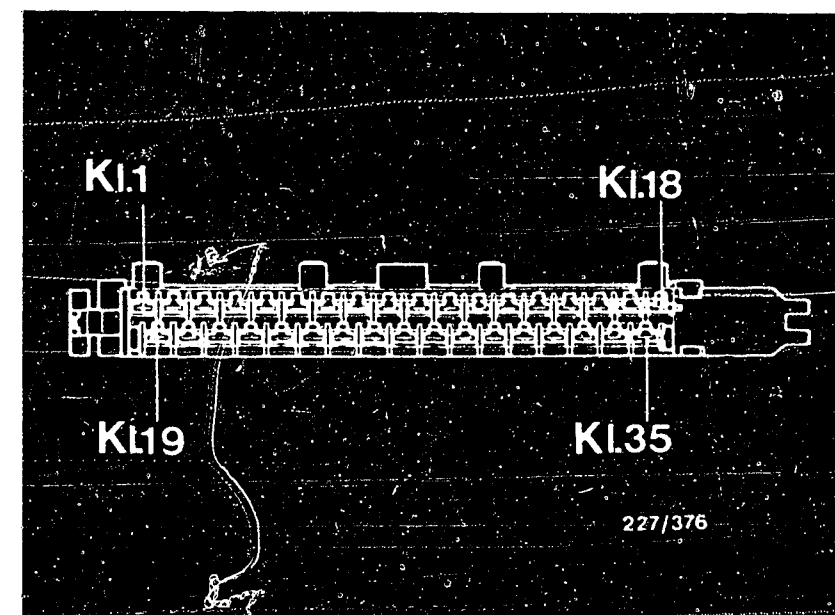
In each case ohmmeter must indicate approx. 0  $\Omega$   
(continuity).

Eliminate open circuit.

If there was no open circuit, renew engine-speed  
sensor (2). See bottom picture.

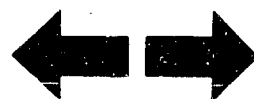
yes

Continued on F11/F12



**F9**

Trouble-shooting program  
Audi 200, as of 8.83



**F10**

Trouble-shooting program  
Audi 200, as of 8.83



yes

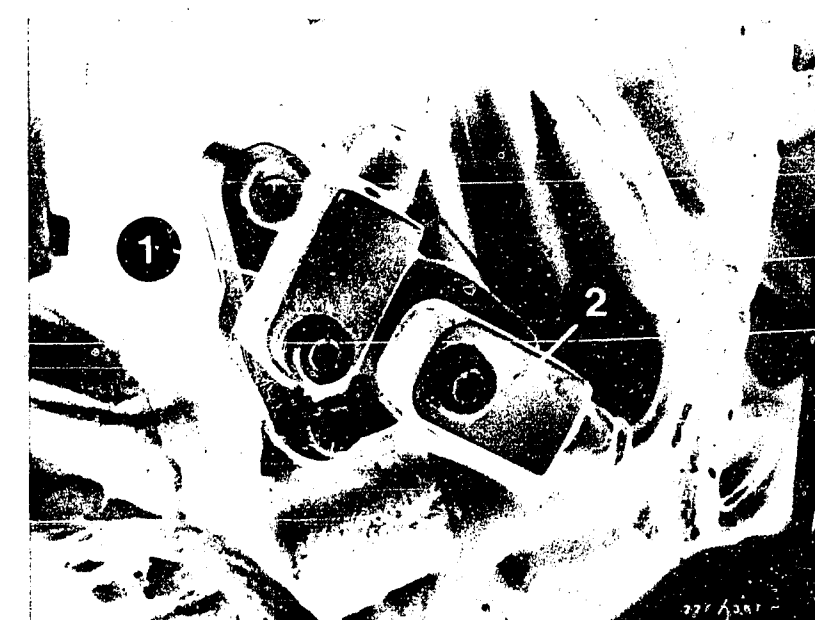
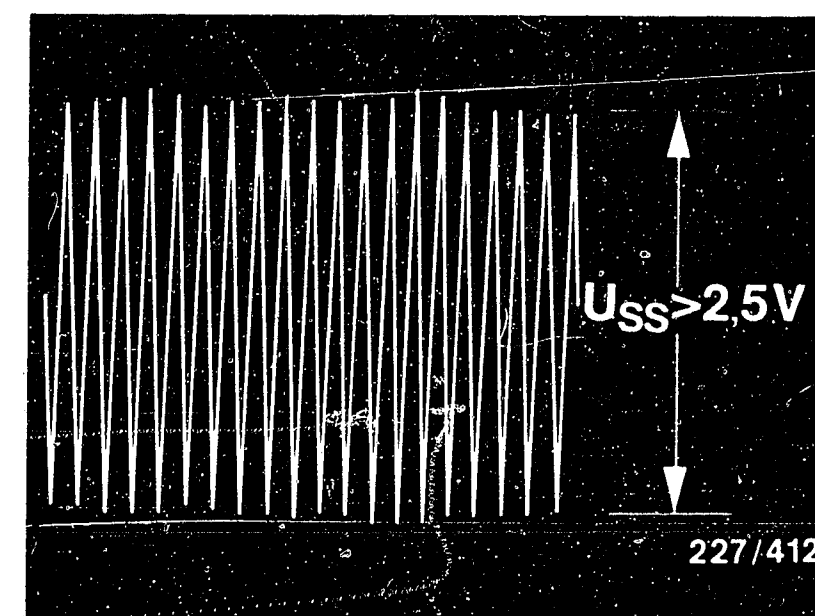
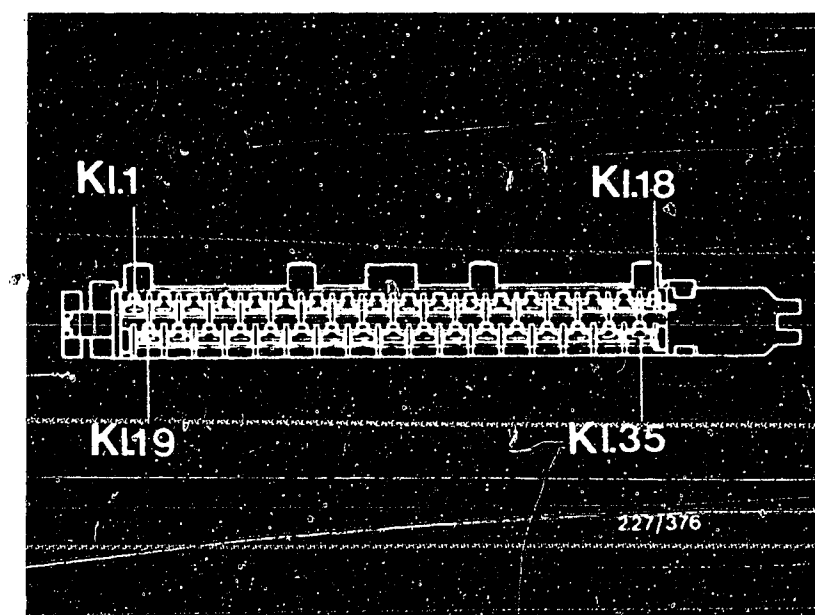
Test engine-speed sensor voltage.

Control unit plug disconnected.  
Connect oscilloscope according to  
operating instructions with program  
switch in "special" position.  
For example, MOT 201:  
Connect red and black terminals with  
test prods to disconnected control unit  
plug term. 29 (+) and term. 11 (-).  
See top picture.  
Start engine.  
Oscilloscope must indicate a sensor  
voltage of at least 2.5 V.  
See centre picture.  
Voltage O.K.?

Renew engine-speed sensor (2).  
See bottom picture.

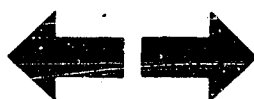
yes

Continued on F13/F14



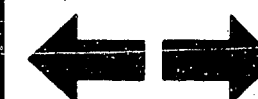
**F11**

Trouble-shooting program  
Audi 200, as of 8.83



**F12**

Trouble-shooting program  
Audi 200, as of 8.83





yes

Test insulation of reference-mark sensor (1).

Control unit plug disconnected. See top picture.

Connect ohmmeter with test prods to disconnected control unit plug term. 12 and term. 28. Ohmmeter must indicate  $\infty \Omega$ . Resistance O.K.?

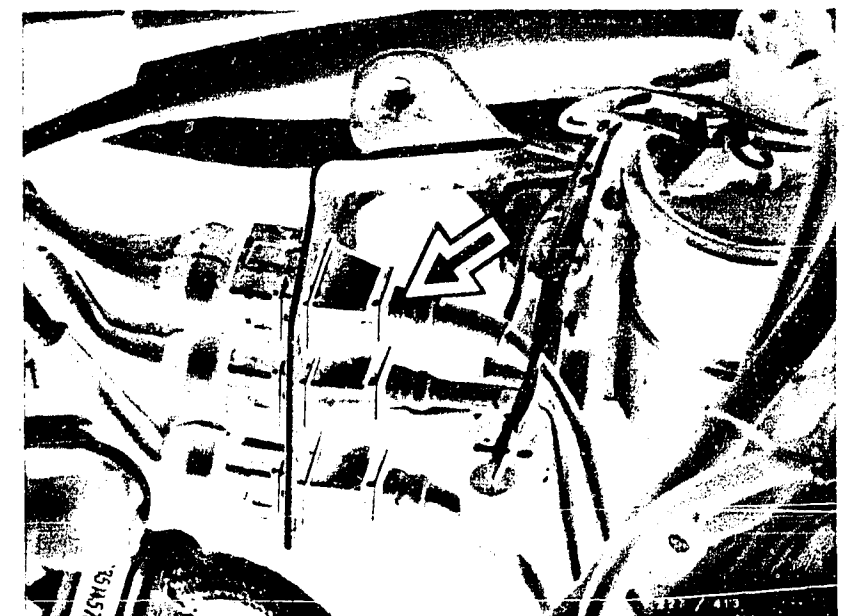
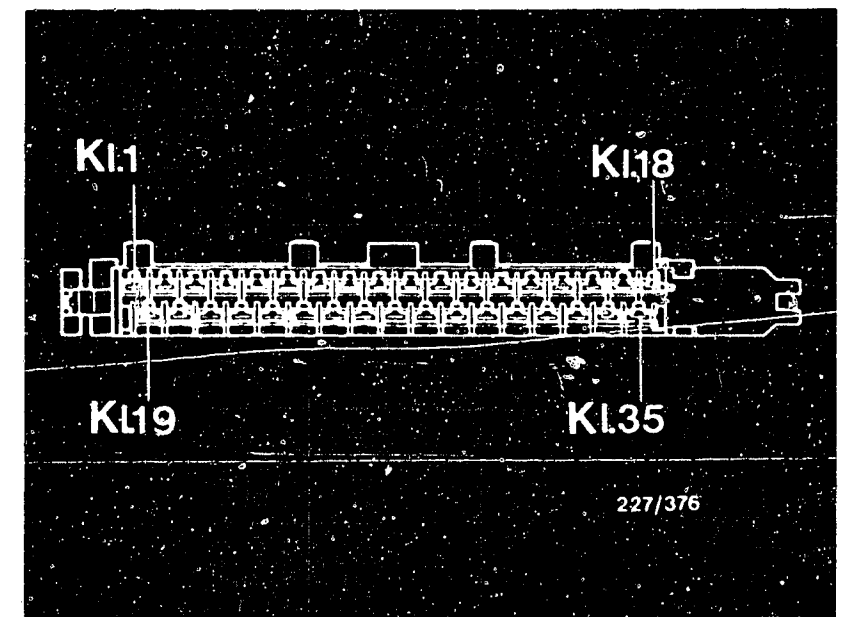
no

If resistance is approx.  $1 \text{ k}\Omega$ , undo black reference-mark sensor plug connector. See arrow in centre picture. If resistance is now  $\infty \Omega$ , renew reference-mark sensor (1). See bottom picture.

If resistance is approx.  $0 \Omega$ , renew 3-core shielded lead between plug connector and control unit plug, or wiring harness.

yes

Continued on F15/F16



**F13**

Trouble-shooting program  
Audi 200, as of 8.83



**F14**

Trouble-shooting program  
Audi 200, as of 8.83





yes

Test internal resistance of reference-mark sensor.

Control unit plug disconnected.  
Connect ohmmeter with test prods to disconnected control unit plug term. 12 and term. 13.  
See top picture.  
Ohmmeter must indicate approx. 1 k  $\Omega$ .  
Resistance O.K.?

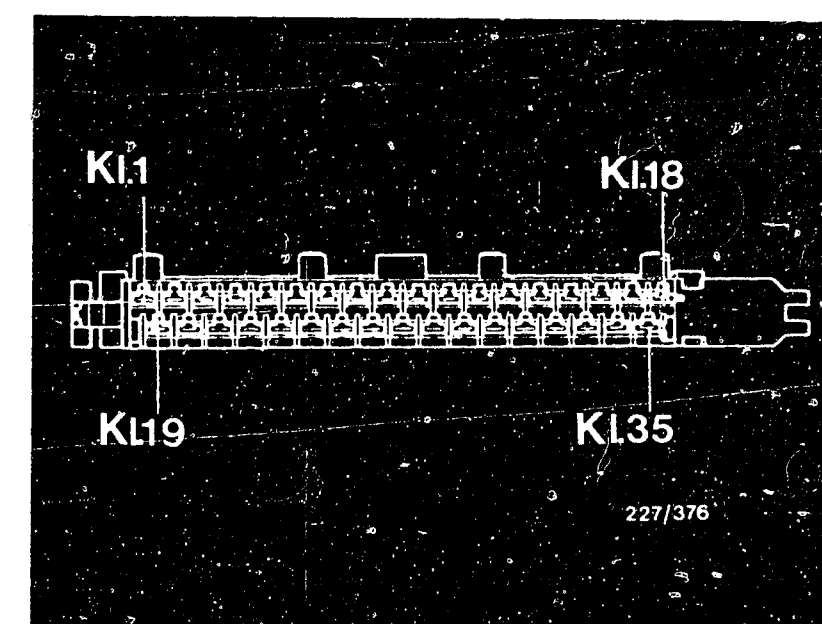
no

If ohmmeter indicates  $\infty \Omega$ , undo black reference-mark sensor plug connector. See arrow in bottom picture.

yes

Continued on F19/F20

Continued on F17/F18

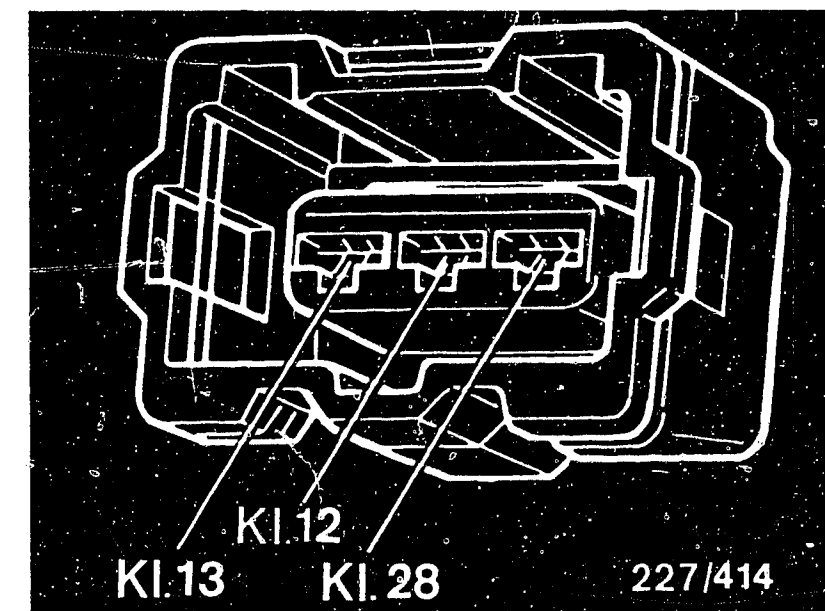
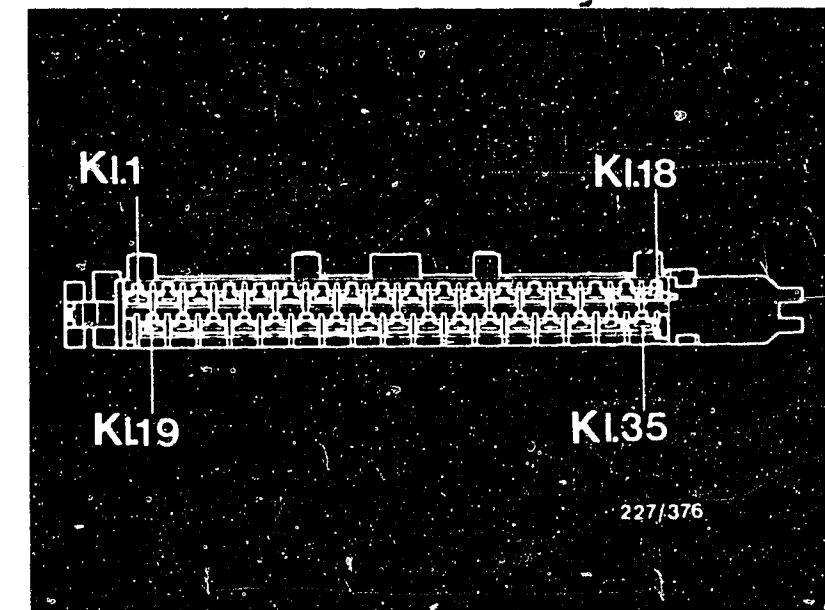


Continued

Connect ohmmeter consecutively to:

Control unit plug		Reference-mark sensor connector (black)
Term. 12	and	term. 12
Term. 13	and	term. 13

In each case ohmmeter must indicate approx. 0  $\Omega$  (continuity).  
Eliminate open circuit.  
If there was no open circuit, renew reference-mark sensor (1).  
See bottom picture.



yes

Continued on F19/F20

**F17**

Trouble-shooting program  
Audi 200, as of 8.83



**F18**

Trouble-shooting program  
Audi 200, as of 8.83



yes

Test reference-mark sensor voltage.

Control unit plug disconnected.

Connect oscilloscope according to operating instructions with program switch in "special" position.

For example, MOT 201:

Connect red and black terminals with test prods to disconnected control unit plug term. 13 (+) and term. 12 (-).

See top picture.

Start engine.

Oscilloscope must indicate a sensor voltage of at least 2 V.

See centre picture.

Note: Sensor signal must start with positive rise.

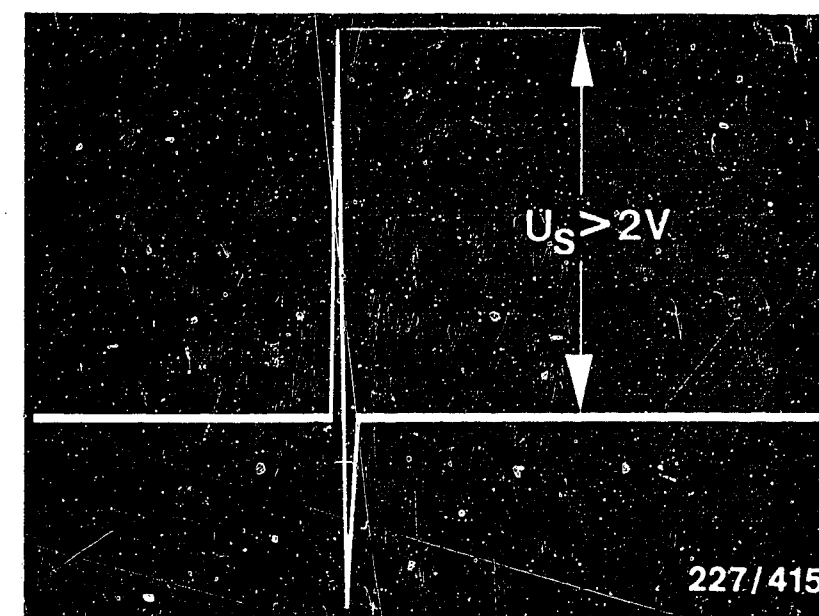
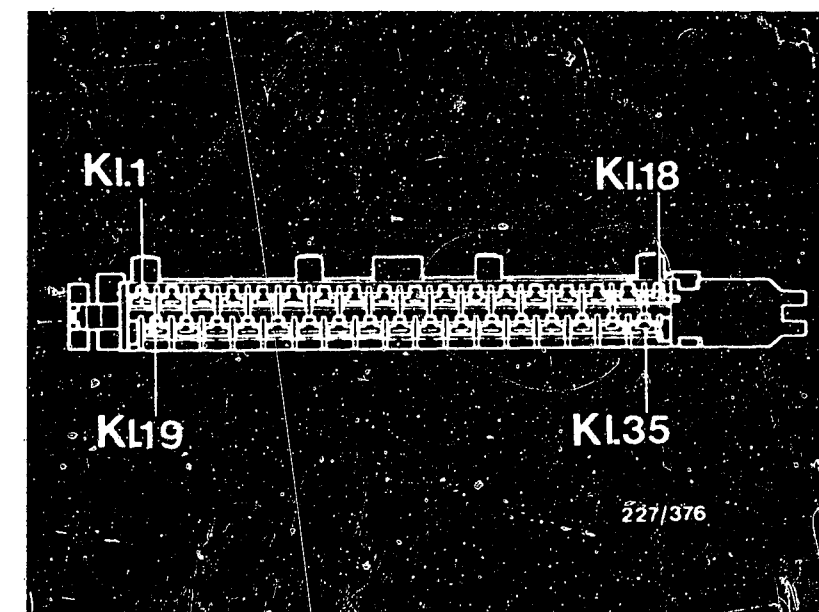
Voltage O.K.?

no

Renew reference-mark sensor (1).  
See bottom picture.

yes

Continued on F21/F22



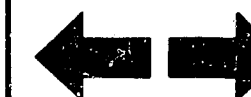
**F19**

Trouble-shooting program  
Audi 200, as of 8.83



**F20**

Trouble-shooting program  
Audi 200, as of 8.83



yes

Test ignition pulse generator power and control lead.

Press wire retaining clip of ignition distributor plug. Disconnect ignition distributor plug. See top picture.  
Control unit plug disconnected.  
Connect ohmmeter with test prods consecutively to:

Ignition distributor plug		Control unit plug
Term. 25	and	term. 25
Term. 27	and	term. 27
Term. 4	and	term. 4

In each case ohmmeter must indicate approx. 0  $\Omega$  (continuity).

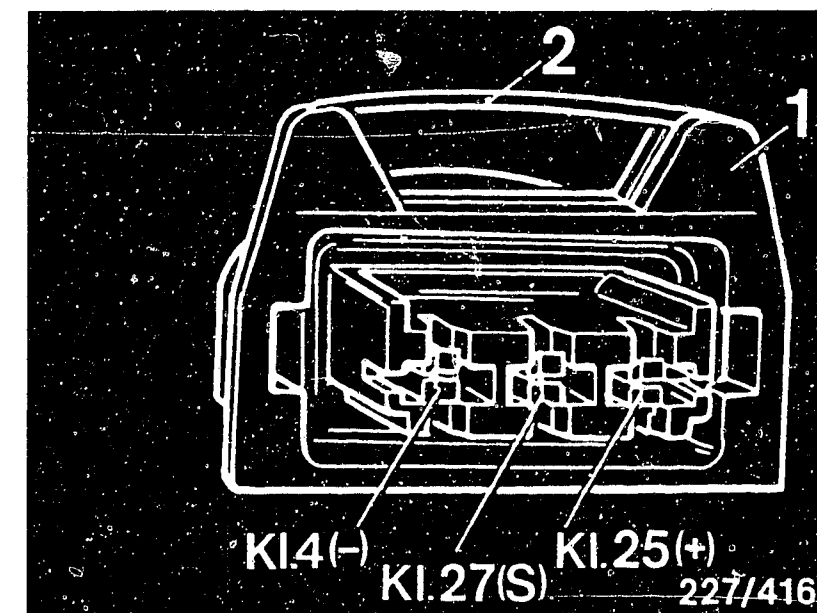
Resistance O.K.?

no

Eliminate open circuit

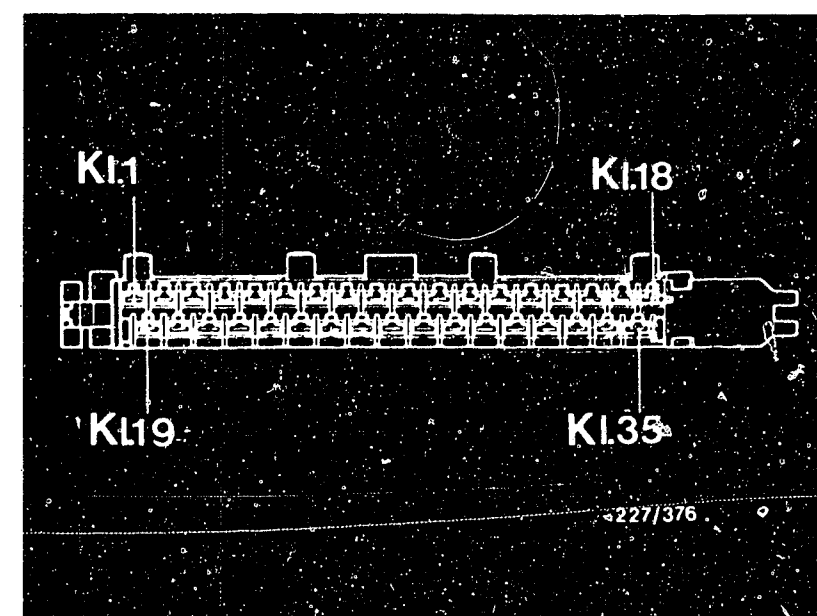
yes

Continued on F23/F24



1 = Ignition distributor plug  
2 = Wire retaining clip

Control unit plug



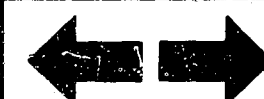
**F21**

Trouble-shooting program  
Audi 200, as of 8.83



**F22**

Trouble-shooting program  
Audi 200, as of 8.83



yes

Test ignition pulse generator power supply.

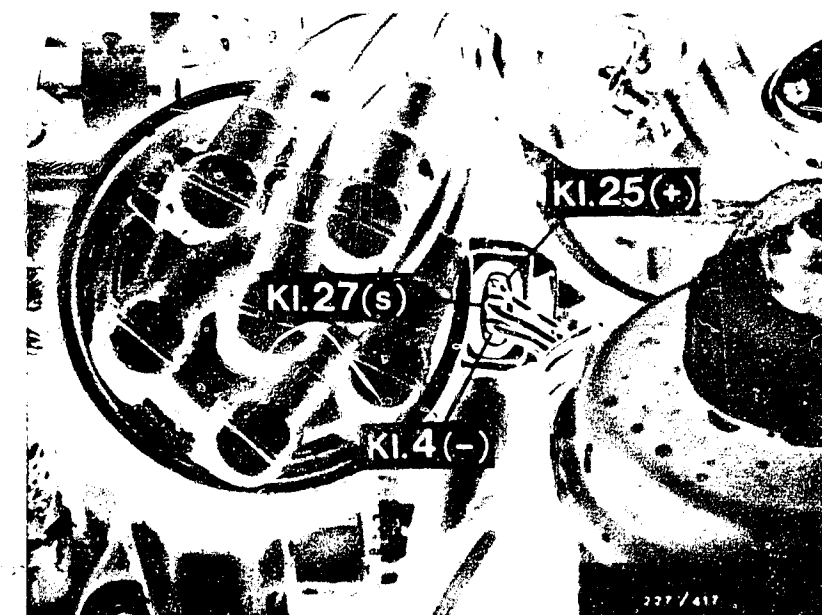
Control unit plug and ignition distributor plug connected.  
Push back rubber sleeve of ignition distributor plug.  
Connect voltmeter with test prods to ignition distributor plug term. 4 (-) and term. 25 (+).  
See picture.  
Switch on ignition.  
The measured voltage must be at least 10 V.  
Voltage O.K.?

no

Renew control unit.

yes

Continued on G1/G2



**F23**

Trouble-shooting program

Audi 200, as of 8.83



**F24**

Trouble-shooting program

Audi 200, as of 8.83



yes

Test operation of ignition pulse generator.

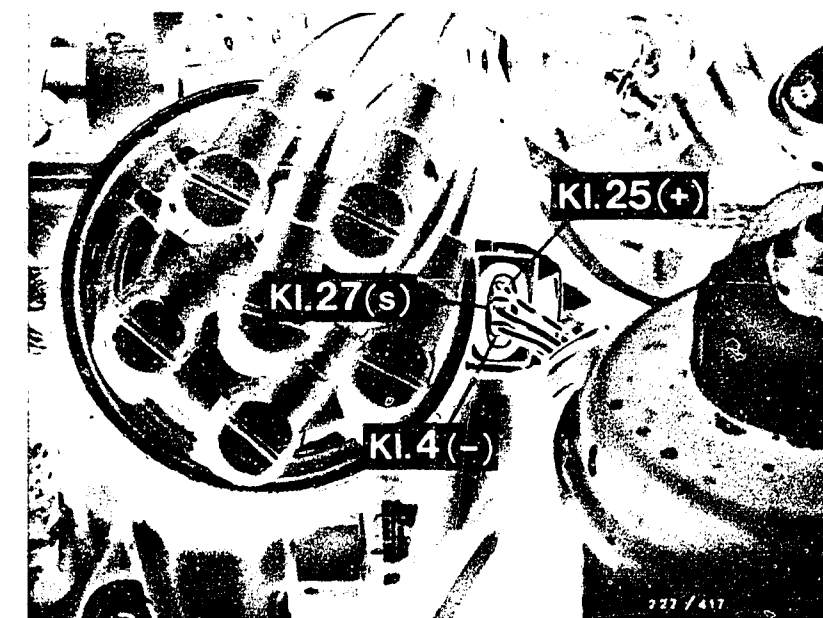
Control unit plug and ignition distributor plug connected.  
Push back rubber sleeve of ignition distributor plug.  
Connect oscilloscope according to operating instructions with program switch in "special" position.  
For example, MOT 201:  
Connect red terminal with test prod to ignition distributor plug term. 27 (measured signal). See top picture.  
Connect black terminal to ground.  
Start engine.  
Oscilloscope must show a rectangular signal.  
See bottom picture.  
Rectangular signal present?

no

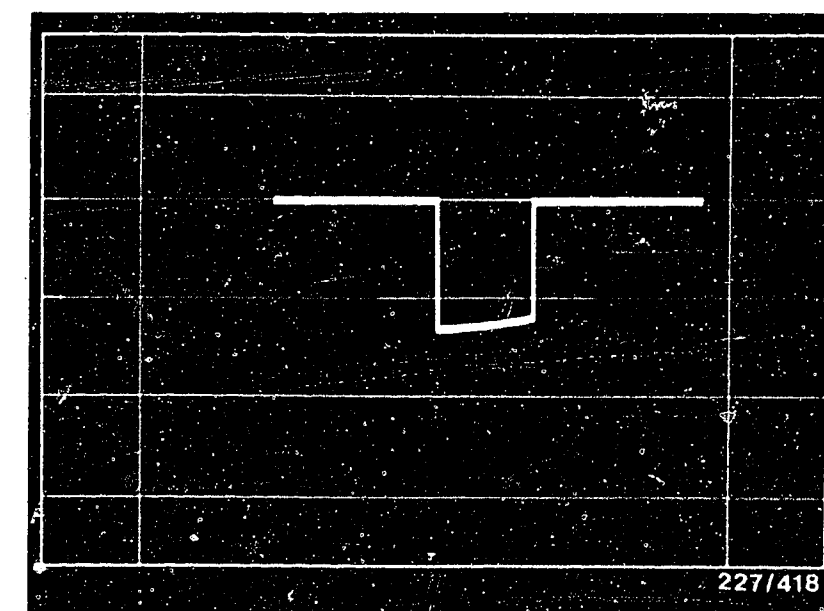
Renew ignition pulse generator or ignition distributor.

yes

Continued on G3/G4



Rectangular signal



G1

Trouble-shooting program  
Audi 200, as of 8.83



G2

Trouble-shooting program  
Audi 200, as of 8.83





yes

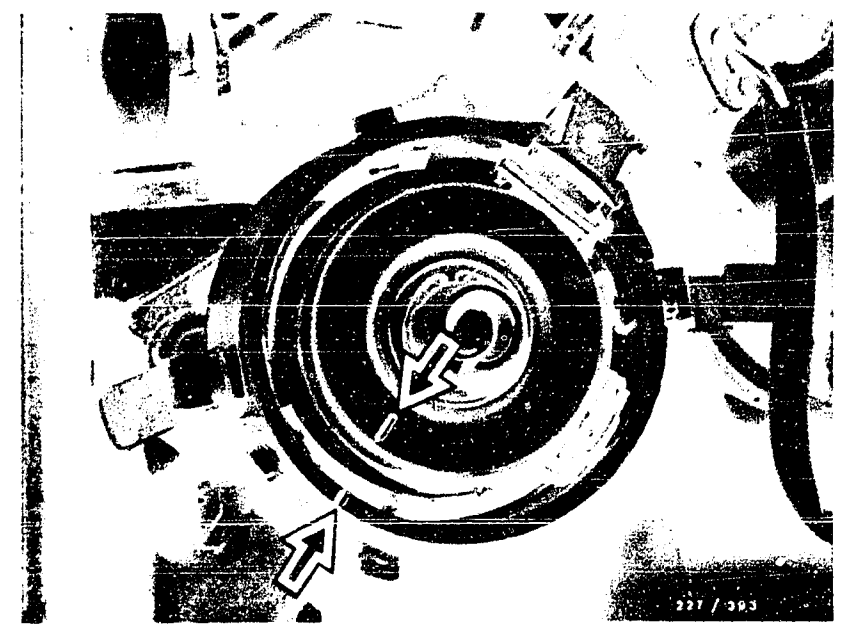
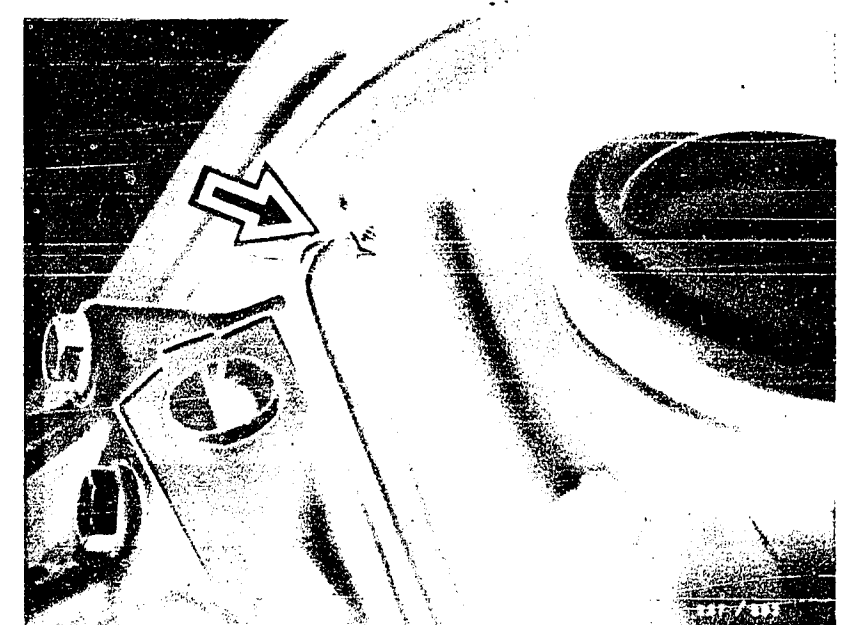
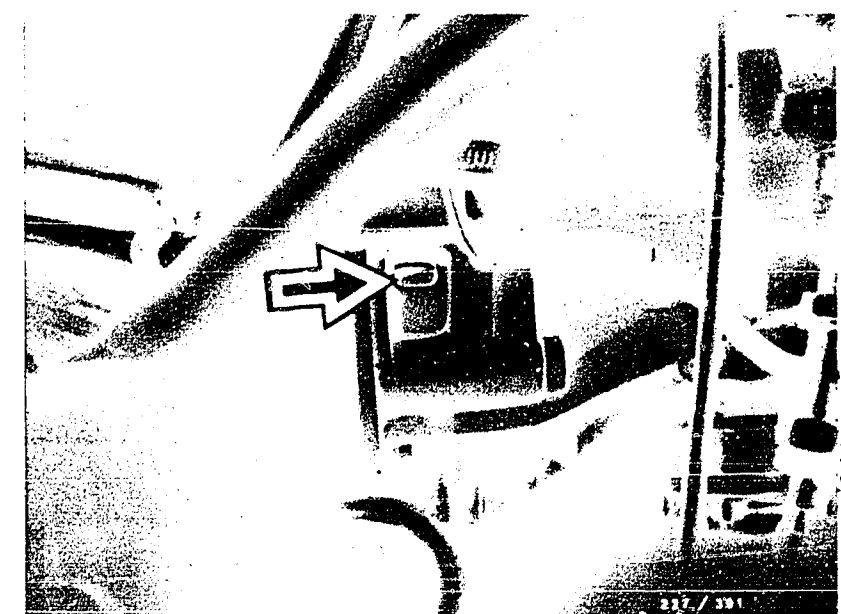
Test ignition distributor adjustment.  
Set crankshaft cyl. 1 to TDC.  
See top picture for mark.  
At the same time, mark on camshaft gear must align with top edge of valve cover gasket.  
See arrow in centre picture.  
Remove cap and dust-protection cover from ignition distributor.  
Mark on trigger wheel must align with mark on ignition distributor housing. See arrow in bottom picture.  
Ignition distributor adjustment O.K.?

no

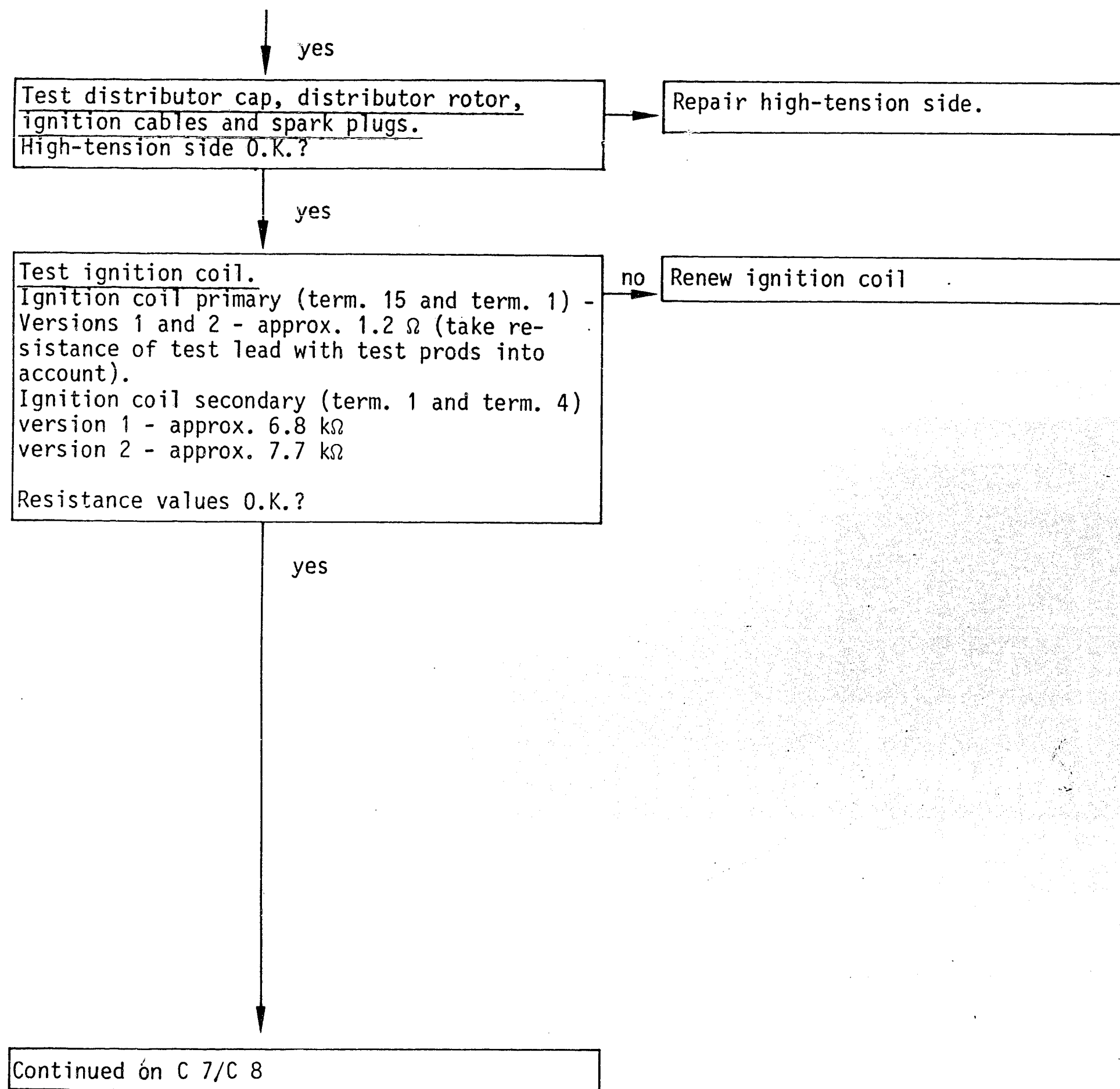
Adjust ignition distributor.

yes

Continued on G 5/G 6







Ignition coil - version 1

3a = Ignition coil - version 2



**G5**

Trouble-shooting program  
Audi 200, 8.83 →



**G6**

Trouble-shooting program  
Audi 200, 8.83 →



yes

### Test power output stage.

Control unit plug and ignition distributor plug connected.  
Disconnect power output stage plug. See arrow in top picture.  
Connect oscilloscope according to operating instructions with program switch in "special" position.  
For example, MOT 201:  
Connect red terminal with test prod to power output stage plug term. 22 (measured signal). See top picture.  
Connect black terminal to ground.  
Start engine.  
Oscilloscope must show a rectangular signal. See centre picture.  
Rectangular signal present?

no

Remove control unit cover in front passenger footwell.  
Disconnect control unit plug. See bottom picture.  
Connect ohmmeter with test prods consecutively to

Control unit plug

Power output stage plug

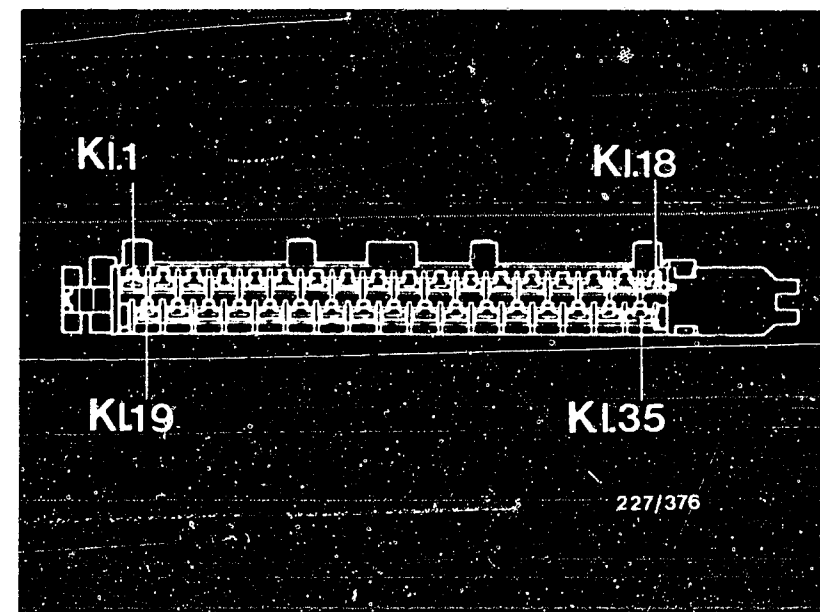
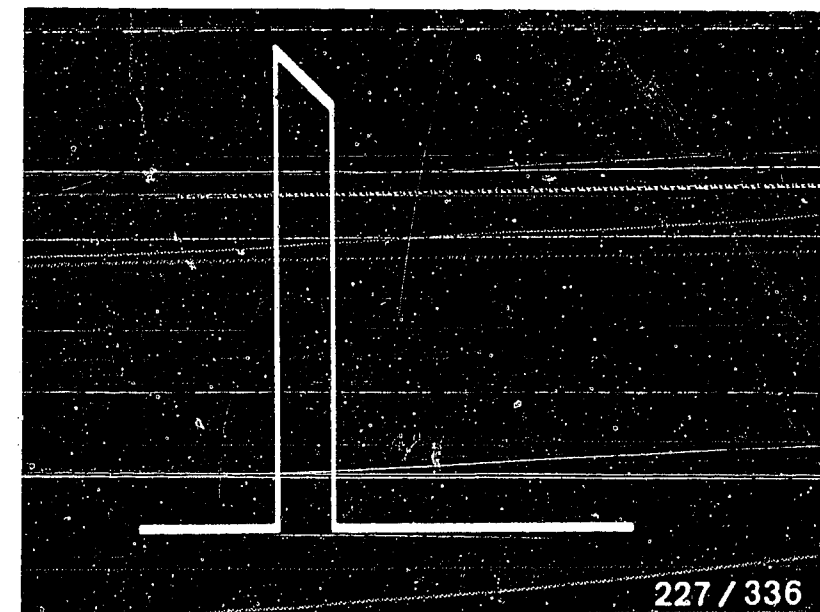
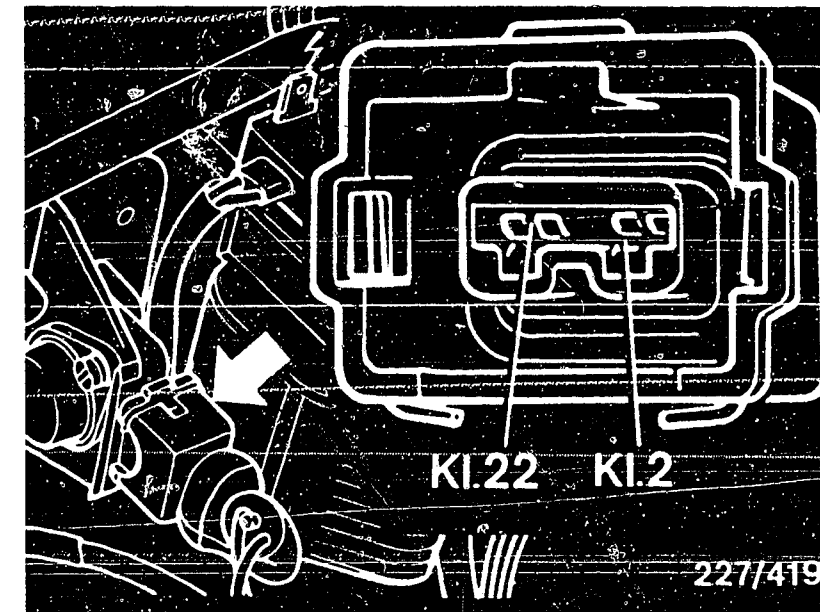
Term. 22 and  
Term. 2 and

term. 22  
term. 2

Ohmmeter must indicate approx.  $0\ \Omega$  (continuity). If approx.  $0\ \Omega$  is indicated, renew control unit.

yes

Continued on G9/G10



**G7**

Trouble-shooting program  
Audi 200, as of 8.83



**G8**

Trouble-shooting program  
Audi 200, as of 8.83



yes

Renew power output stage.  
See arrow in top picture.

Testing completed.

Tests from C 9 onward not necessary.

Note:

If customer complaint still not remedied,  
look for further faults in fuel system,  
or engine not mechanically O.K.



3a = Ignition coil - version 2

**G9**

Trouble-shooting program  
Audi 200, as of 8.83



**G10**

Trouble-shooting program  
Audi 200, as of 8.83



# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

22

Danger of Accident on Semi-conductor Ignition Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufactures starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

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**N1**

Technical Bulletin

Audi 200, 8.83 →

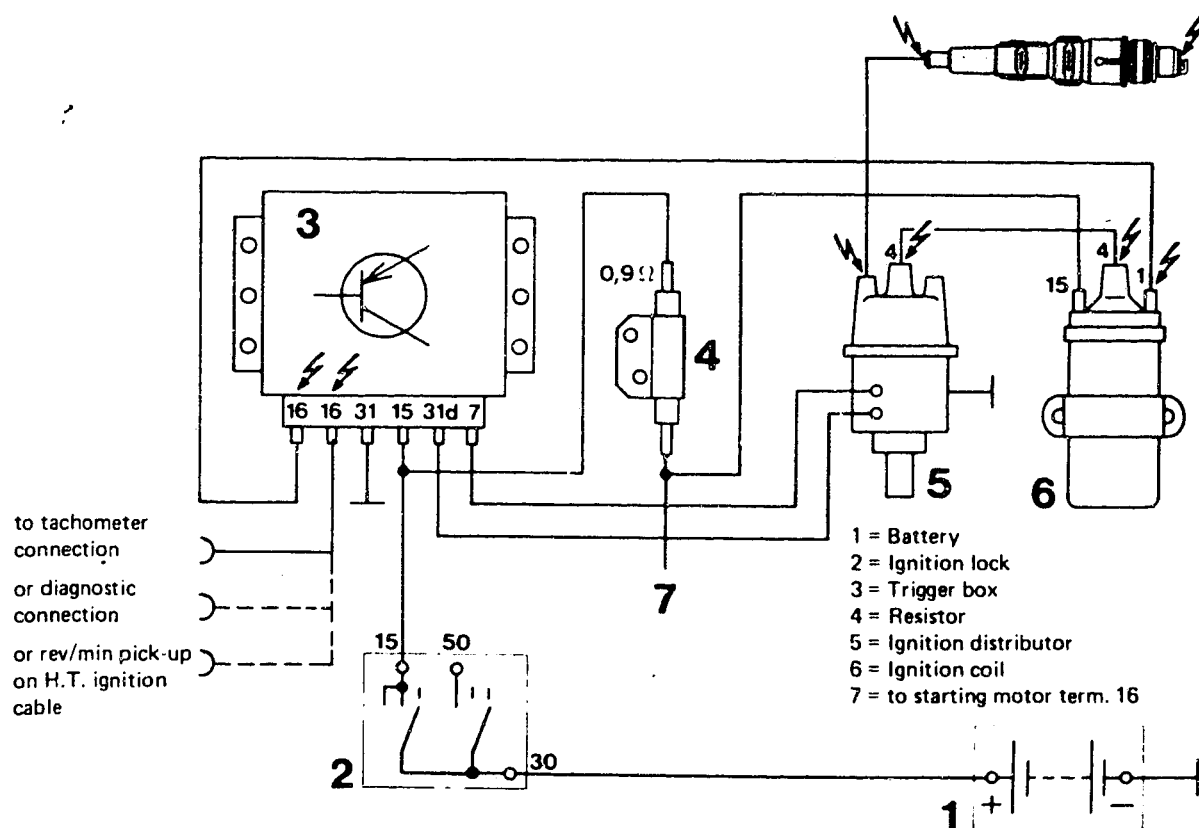


In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram



# After-sales Service

## Technical Bulletin

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EFFECTS OF ELECTRICAL AND ELECTRONIC  
SYSTEMS ON HEART PACEMAKERS

VDT-I-227/107 En  
1.1981

e.g. ignition systems, Jetronic, Motronic, ABS

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency).  
Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.



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Technical Bulletin

Audi 200, 8.83 →



We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.





# After-sales Service

## Technical Bulletin

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### NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En

1.1983

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Coil ignition	SZ (CI)	-----	Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I* (TCI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
	TSZ-H	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized ignition	TZ-I* (TI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in Hybrid technique)	TZ-H* (TI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)



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**N5**

Technical Bulletin

Audi 200, 8.83 →



Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Breakerless semiconductor ignition with or without knock control	EZ EZ-K	- K=Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributorless ignition with or without knock control	VZ VZ-K	- K=Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

\*Note: The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).



# After-sales Service

## Motor Vehicle Service Information

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INCORRECT DISPLAY OF ROTATIONAL SPEED AND  
DWELL ANGLE ONLY WITH TRIGGER BOXES  
0 227 100 ... (TCI-i, TCI-h) WITH CURRENT  
LIMITATION

VDT-I-Gen. 030 En.  
6.80  
Supersedes Ed. 3.80

For additional information see VDT-I-Gen. 032 En

### 1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

MOT 001.00}	Rotational-speed	KTE 001.00
001.01}	display O.K. with these	001.02
001.02	testers	001.03
001.04		
002.00		

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

Audi	(Bosch/Fairchild- ignition system)	Mazda	(Mitsubishi ignition system)
BMW	(Bosch ignition system)	Mitsubishi	(Mitsubishi ignition system)
Citroen	(Delco ignition system)	Nissan-Datsun	(Hitachi ignition system)
Fiat	(Delco ignition system)	Peugeot	(Bosch ignition system)
Ford	(Delco ignition system)	VW	(Bosch/Fairchild ignition system)
General- Motors	(HEI-ignition system)	Bosch transistorized ignition system for retrofitting 0 227 100 920	

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**N7**

Service Information

Audi 200, 8.83 →



## 2. Test instructions

### 2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min<sup>-1</sup> to 1200 min<sup>-1</sup>).

It is, however, possible to attain correct rot.-speed measurements as follows:

Connect a ballast resistor of 0.9 or 1.0 Ohm (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

### Suggestion for user manufacture

Required parts:

1 ballast resistor 0.9 Ohm  
or  
1 ballast resistor 1.0 Ohm  
2 blade receptacles e.g.  
approx. 0.2 m cable, 1.5 mm<sup>2</sup> e.g.  
2 insulated clips

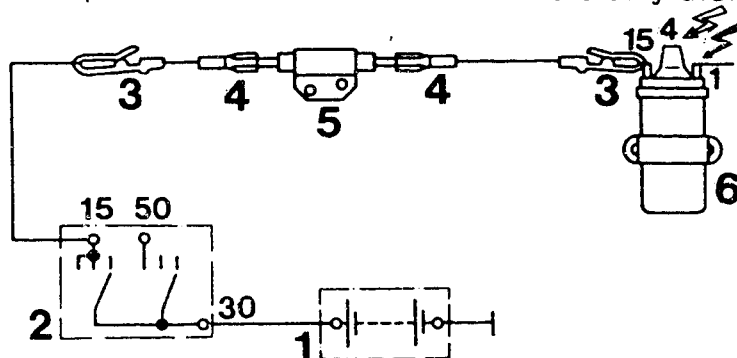
Part No. 0 227 900 002

Part No. 0 227 900 101

Part No. 1 901 355 881

Part No. 6 210 150 150

Commercially available



1 = Battery

2 = Ignition switch

3 = Clips

4 = Blade receptacle

5 = Ballast resistor

6 = Ignition coil

⚡ approx. 400 V

⚡ approx. 25 kV

### 2.2 Dwell angle

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

### 2.3 Ignition point

Is displayed correctly. Connect tester as per operating instructions.



# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

### MOTORTESTER CONVERSION

Incorrect display of rotational speed,  
dwell angle and ignition point  
only with trigger boxes  
0 227 100 ... (TCI-i, TCI-h) with current  
limitation

VDT-I-Gen. 032 En  
6.80

For additional information see VDT-I-Gen. 030 of 6.80

Re.: Motortester EFAW 268  
268 S 10  
269  
214 B  
AE 2000

#### 1. General

Please make sure that the above-mentioned motortesters in your workshop and at your customers (e.g. motor vehicle workshops, oil companies, gas stations, vocational schools etc.) are converted. The conversion is subject to payment and is carried out by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with fitting of switch).

#### 2. Why motortester conversion?

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system. There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing light is triggered by the signal path dwell angle - meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

#### 3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing light is triggered by the clamp-on induction pickup and the pulse shaper stage.

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**N9**

Service Information

Audi 200, 8.83 →





#### 4. Test instructions

##### 4.1 Standard ignition systems

Switch position: "standard"

All other tester connections as per operating instructions.

##### 4.2 Ignition systems with current limitation

Switch position: "current limitation"

In order to trigger the timing light, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.





# After-sales Service

## Motor Vehicle Service Information

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TESTS ON ELECTRONIC IGNITION SYSTEMS  
(TCI, TZ)  
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En  
3.1981

The following tests are listed in older and current Tester operating instructions or in Trouble-shooting with the oscillograph.:

- "Separate ignition coil test" (concerns EFAW 213, 214, 268, AE 2000).
- "Calculating the "ignition voltage reserve"" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- "Intensified insulation test" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7-Information K7-VJF 17/8012.

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**N12**

Service Information

Audi 200, 8.83 →

